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MISSOURI BOTANICAL GARDEN BULLETIN

VOLUME XXIII

WITH 28 PLATES

1935

ST. LOUIS, MISSOURI

PUBLISHED MONTHLY EXCEPT JULY AND AUGUST,
BY THE BOARD OF TRUSTEES

SUBSCRIPTION PRICE:

ONE DOLLAR A YEAR SINGLE NUMBER TEN CENTS

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Vol. XXIII JANUARY, 1935 No. 1

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OF THE MISSOURI BOTANICAL GARDEN

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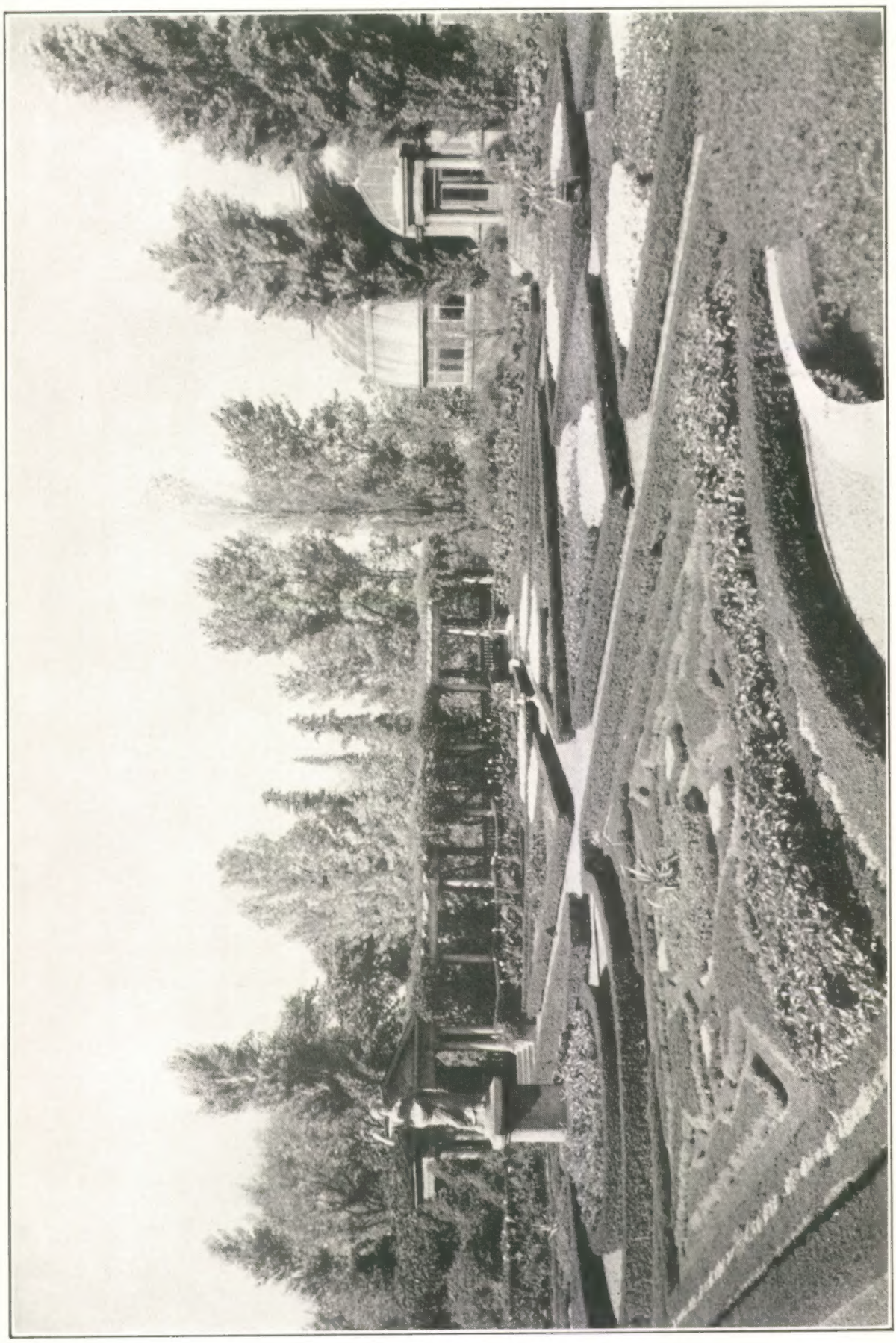

VIEW OF ITALIAN GARDEN

Missouri Botanical Garden Bulletin

Vol. XXIII JANUARY, 1935 No. 1

FORTY-SIXTH ANNUAL REPORT OF THE DIRECTOR

Gentlemen:

I have the honor to submit herewith the forty-sixth annual report of the Director.

For the past few years, no reference having been made in these reports to finances, the impression has arisen that the Garden has not been affected by the depression. Nothing could be further from the facts. Like all similar institutions, the income of which is derived from real estate and securities, the gross returns have steadily fallen since 1928. This, however, is not all of the story. Unlike most botanical gardens, the entire income of the Missouri Botanical Garden is not available for maintaining its various activities, including the library, herbarium, scientific work, etc., stipulated in the will of Henry Shaw. Taxes, insurance, and the maintenance of the estate, together with certain annual bequests made by Henry Shaw, must be deducted and the Garden simply has what is left. The accompanying diagram (fig. 1) will show how the maintenance of the Garden has been squeezed between the lowering of the gross income and the raising of the cost of the above items. There must also be taken into consideration the almost universal rise in prices of fuel, scientific publications, and supplies, which has become an increasing load on the diminishing amount available for Garden purposes.

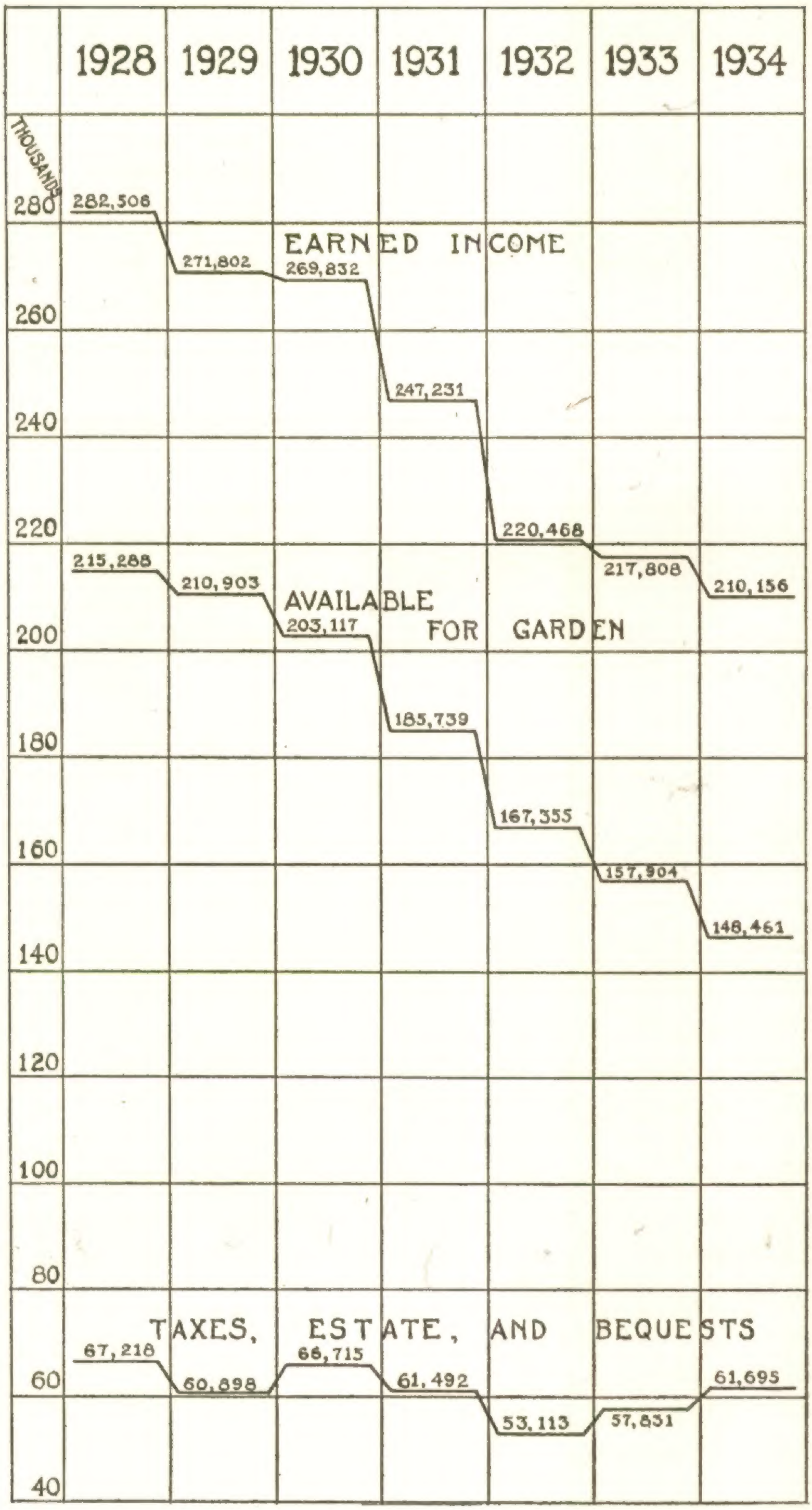
1928
1929
1930
1931
1932
1933
1934
THOUSANDS
280
260
240
220
200
180
160
140
120
100
80
60
40
EARNED INCOME
282,506
271,802
269,832
247,231
220,468
217,808
210,156
AVAILABLE FOR GARDEN
215,288
210,903
203,117
185,739
167,355
157,904
148,461
TAXES, ESTATE, AND BEQUESTS
67,218
60,898
66,715
61,492
53,113
57,831
61,695

Fig. 1

ORCHID DISPLAY, 1934

SPRING BULB EXHIBIT, 1934

While, in spite of difficulties, the normal activities of the Garden have not been curtailed in a way to cause permanent damage, certain improvements and developments have had to be deferred because of these conditions.

Because the Garden is not a tax-supported institution it has as yet been unable to secure Federal funds which have so benefited other botanical gardens and parks. It is a well-recognized fact that public institutions receiving assistance from various emergency funds provided by municipal, state, or federal means have been able to complete work which even in better times could not have been contemplated; so that in spite of the reduction of normal income they really are better off because of the depression than they would otherwise have been.

MAIN CONSERVATORIES

No marked changes have been made in the palm house, although there have been valuable additions of certain exotic plants, such as crotons, jacobinias, and various aroids. The two giant bulbs of *Amorphophallus Titanum,* secured from Sumatra in 1933, produced bewildering growths during the year, increasing from a mere five inches per week in early stages to a maximum of thirty inches per week. The shoots are now approximately seven feet high. The plants in the palm house, though tropical in natural habitat, suffered worse from the devastating heat of the summer than perhaps any other group. During August three truckloads of dead branches were hauled from this house alone. The specimen of *Cocos flexuosa* was removed during the summer owing to its great size, and replaced by a smaller tree of the same species.

In the cycad-fern house the decorative features have been maintained as in former years. The vigorous tropical grape vine has festooned itself luxuriantly along the beams of the greenhouse, sending down aerial roots in abundance, some of them forty feet long.

The larger plants in the economic house have been pruned back in order to permit light and air to reach the lower-growing plants beneath. This house has been supplied with a complete set of new labels, attached to metal pipes instead of the wooden standards formerly used.

Owing to the increasing public interest in desert plants and the very considerable additions to the Garden's collections in recent years, the house formerly used for coffee and banana trees was divided, the eastern half of it being used for a "South African" house. The South African plants were segregated because of the fact that the vast majority of them bloom at a time when most American desert plants are at rest. At present about 120 species are contained in the collection, which is being constantly added to. The coffee and banana plantations, always of interest to visitors, will be found in the west half of the same house which they have occupied for many years.

Valuable donations of desert plants received during the year from botanical institutions and private collectors number over 400 packets of seeds and cuttings. This collection now contains some 700 species, of which at least 100 bloomed during the past year in the cactus house.

INDOOR FLORAL DISPLAYS

On January 27 the annual orchid show was opened to the public. Always one of the most difficult flowers to display to advantage, the orchids this year were shown in a succession of white plaster alcoves opening with arches on a central court. The alcoves were lined with cedar boughs and small groups of plants were arranged in each alcove. These were often replaced so that the exhibit was always at its best. The "Queen of the Show" may be said to have been the wonderful blue orchid from Burma, the *Vanda caerulea,* blooming here for the first time, while the "Dancing Girl" was again a favorite. Many of the mauve "Tulipans" and the fragrant "Flor de Mayo" occupied conspicuous positions. Much attention was attracted by one of the Garden's hybrids, shown for the first time, a cross made five years ago of *Brassocattleya Fournierii* and *Cattleya Trianae.* At the rear of the house was a jungle representation, the plants being attached to trees after the manner of their natural growth, and the floor covered with terrestrial orchids, ferns, and other tropical plants.

The azalea show, opened on March 3, was arranged in informal beds to display the gorgeous masses of color of the flowers against a background of rush fence.

CHRYSANTHEMUM SHOW, 1934

JAPANESE GARDEN HOUSE

CHRYSANTHEMUM SHOW, 1934

The Easter display of flowering bulbs was ready on March 31, the first show of this kind since 1931. The plants were arranged in a formal garden surrounding a Greek temple, with paths of white marble stepping-stones and plots of grass. On April 14 this garden was replaced by the various spring-flowering annuals, schizanthus, annual chrysanthemums, salpiglossis, marguerites, ornithogalums, and the regal lilies. Another change was necessary early in May, when the Martha Washington geraniums comprised the main display.

On May 19 and 20 the annual spring show of the St. Louis Horticultural Society was held at the Garden, with its usual successful exhibition of locally grown plants. On May 26 the hydrangea show was installed, followed in a few weeks by a display of fancy-leaved caladiums which occupied the floral display house during the remainder of the summer.

On October 4, a duplicate of the orchid bouquet carried by the Queen of the Veiled Prophet was placed on exhibition and maintained for nine days in an electric display refrigerator, so that all those not fortunate enough to attend the ball might enjoy the unrivaled beauty of this gorgeous collection of orchids presented each year by the Garden to the Queen.

On October 20 and 21 the St. Louis Horticultural Society held its fall flower and dahlia show which was easily the most successful one ever held. The ideal fall weather made possible a display of fine plants.

In point of attendance the chrysanthemum show, which held sway through the month of November, was the most successful one the Garden has offered. Ideal weather conditions and favorable publicity by the press contributed to the large attendance. The pool at the south end of the house was covered and transformed into a garden. Over a wall across the center of this garden the cascade chrysanthemums were shown and surrounding these were beds of the bush varieties.

December brought the Christmas show of poinsettias, interspersed with stevia and other incidental flowers to provide a suitable and colorful background.

During the year blooming orchids were to be found always in the alcoves of the aroid house. In August five plants of the rare "Dove" or "Holy Ghost" orchid bloomed profusely at

the Arboretum greenhouses, for the first time in four years. In spite of all precautions, two were burned by the excessive summer heat. One plant, bearing twenty blooms, was sent to the Century of Progress Exposition at Chicago where it elicited great admiration from visitors and much publicity in the press. The Garden also presented to the Century of Progress a collection of tropical water-lilies comprising Nymphaeas and *Victoria Cruziana*. These were displayed through the summer in the Italian garden near Horticultural Hall.

At the close of the various flower shows throughout the year, such flowers as were worth while were cut and distributed by the Book and Flower Guild to the following institutions. This is a custom which has prevailed for many years and undoubtedly brings great pleasure to many who are unable to visit the flower shows at the Garden.

Alexian Bros. Hospital
Barnard Free Skin and Cancer Hospital
Bethesda Hospital
Blind Girls Home (scented flowers only)
Central Institute for the Deaf
Children's Home Society of Mo.
Christian Hospital
Christian Old Folks Home
Christian Orphans Home
City Hospital No. 1
City Hospital No. 2
City Infirmary
City Sanitarium
Colored Orphans Home
Deaconess Hospital
DePaul Hospital
Firmin Desloge Hospital
Frisco Hospital
Good Samaritan Altenheim
Home for the Friendless
Home of Aged and Infirm Israelites
Isolation Hospital
Jewish Convalescent Home
Jewish Hospital
Kingdom House Settlement
Kirkwood Old Folks Home
Koch Tuberculosis Hospital
Little Helpers of Holy Souls
Little Sisters of the Poor
Lutheran Altenheim
Lutheran Convalescent Home
Lutheran Hospital
Marine Hospital
Masonic Home
Memorial Home
Methodist Orphans Home
Miriam Convalescent Home
Missouri Baptist Hospital
Missouri Pacific Hospital
Mother of Good Council Home
Mt. St. Rose Sanitarium
Night and Day Camp
Orthodox Jewish Old Folks Home
Peoples Hospital
Russell Home
St. Ann's Hospital
St. Francis Orphans Home
St. John's Hospital
St. Joseph's Deaf and Dumb Home
St. Louis Children's Hospital
St. Louis County Hospital
St. Luke's Hospital
St. Mary's Hospital
St. Mary's Infirmary
Shriners Hospital for Crippled Children
United States Veterans Hospital No. 92

Experimental Greenhouse.—This house now contains over a hundred varieties and species of geraniums, grown in an effort to determine their respective values as bedding stock. In spite of the unfavorable summer several varieties were outstanding, and it is expected that through the continuation of the work more satisfactory bedding stock can be developed. Over a hundred selected varieties of gladiolus were raised and their respective merits determined for this climate. These experiments were discussed at length in the October number of the BULLETIN. Seeds of more than a thousand species of plants, obtained chiefly from foreign botanical gardens, have been tested, some of which may eventually be valuable for introduction into the St. Louis region. This greenhouse also contains the rapidly increasing collection of rhododendron seedlings, experiments on fertilizers for orchids, experimental material for the graduate students, as well as the plants propagated for demonstration in the amateur gardening courses.

OUTDOOR PLANTING

Linnean Garden.—The gradual conversion of the Linnean garden, formerly almost entirely devoted to iris, into a perennial garden has been completed this year, all thirty-two beds having been replanted. The only new plants purchased were a few lilies and Korean hybrid chrysanthemums. The other material was raised from seed or cuttings, or secured by division of plants, as, for instance, the narcissi described in the October BULLETIN.

Rose Garden.—The soil in this garden was renewed during the fall of 1933, and as a result the roses grew splendidly under even the most trying weather conditions of the first half of the summer. After the middle of August, when ample rain and much cloudy and cool weather combined to produce perfect conditions, this garden became one of the most beautiful spots in St. Louis. It has been many years since such a display of roses has been offered to the public, and many of the roses were still in bloom in November. Insect and fungus pests thrived with unusual vigor, and it was necessary to dust the plants a dozen times during the season to keep the foliage free from mildew and black spot.

Other Gardens.—The Italian garden contained an unusually striking display of highly colored foliage plants arranged in formal beds. The heat in this garden was extreme, far exceeding any other part of the Garden, due to its western exposure and the fact that it is enclosed on three sides by the range of conservatories. Constant and copious watering was necessary to keep the plants in a presentable condition. The economic garden was maintained as in former years with its interesting farm and textile crops, examples of ornamental grasses, hedge plants, etc. The iris garden, replanted during 1933, was a thing of unusual beauty in the spring. The peonies and gladiolus which followed the iris maintained interest in this section long after the comparatively short blooming period of the iris themselves. Much labor and material were necessary for the improvement of the borders and beds throughout the main garden. The "Before and After" gardens, originally planted as a feature of the 1927 spring flower show, are of such never-failing interest that they have become a permanent example of the possibility of improving the average back-yard.

Trees and Shrubs.—The growth-retarding effect of dry weather on trees became evident in an indirect way this fall, when the leaf-raking took place. Usually when all lawns have been raked, a pile of leaves 120 feet long, 20 feet wide, and almost 10 feet high has been gathered for composting. This year the leaf pile was but half as large. This indicates that at no time during the summer were the trees carrying a normal amount of foliage nor were individual leaves retained for the normal length of time. Field notes of June 5 record the fact that trees were then shedding leaves to lessen the rate of water loss. Actual withering took place about July 18. On July 23 a definite program of tree watering began, the watering needles developed at the Garden and previously described being employed. Even though six of them, attached to water mains, were in continuous use and two more were used with the power sprayer, only the largest and most valuable trees could be watered. The power sprayer pumped the water to those trees in inaccessible places, and daily pumped between 1,200 and 3,600 gallons, depending upon local conditions. The small trees west of the service road received 10,530 gallons of water

in four days. Immediately after watering they were mulched, twenty-two loads of manure being required for this operation. It is impossible to estimate the total quantity of water so used, but it is gratifying to note that not a single valuable tree was lost.

Throughout the season the power sprayer became the most valuable single piece of equipment used in tree care. During the latter part of May and until June 7, it was used to furnish water under pressure for the tree-feeding guns. A total of 1,700 pounds of fertilizer was used on certain weakened trees. No other method of applying fertilizer would have proven effective, due to the dried condition of the soil. While the feeding results have been more erratic and less predictable than in previous years, the fact remains that only those trees fed a complete fertilizer are making normal growth. Thus, a previous statement, that food is more important than water is further substantiated.

Dry summers generally favor the growth and rapid distribution of the red spider, but 1934 was particularly free of serious infestations. This now seems to have been due to the early shedding of leaves during the previous summer, as a consequence of which fewer insects were enabled to complete their growth and lay eggs before last winter. Some spraying for these insects was necessary, and 2,800 gallons of spray were applied before June 26. At that time the intense heat was seriously burning the wet foliage, and all spraying had to be stopped. However, it was noted that even the slightest infestation of spiders hastened the shedding of drought-injured leaves. The fact that the dry leaves furnished but scant food for the spiders, combined with the rapid shedding of leaves following their establishment upon a plant, proved a very effective control. At least very few individuals could be found this fall. There were no outbreaks of caterpillars. However, leaf miners on oaks and lace-wing flies on some perennials thoroughly enjoyed the hot summer, and it required some spraying to control them. A total of 3,580 gallons of dormant spray and 4,450 gallons of contact spray were applied during the year. The total amount of liquid pumped by the sprayer is estimated at 75,000 gallons.

A shipment of trees and shrubs was received from the Arboretum and heeled in until spring. Planting was attempted on January 19, but due to the extremely dry condition of the soil, was stopped until February 14. At that time it was found that all of the 150 tulip trees had died back to the ground level. Planting was again stopped because of dry weather, and when resumed March 10 the whole shipment was found injured to some extent. In this shipment were also 150 pin oaks, only four of which were alive. Pin oaks are entirely hardy and not difficult to transplant, and their loss indicates the extremely rigorous weather which characterized last winter.

Lawns.—A very early start was made in the propagation of bent grass. By April 28, approximately 25,000 square feet of the nursery had been plowed, disked, hand-raked, and planted. However, even with almost continuous automatic irrigation, very little of the newly planted grass survived. Between August 10 and September 30 all the main lawn area was plowed, disked, levelled, and sown with grass seed. Previous to plowing, 141 loads of manure were spread on the old lawn and in some sections additional commercial fertilizer was used. An area nearly ten acres in extent, west and north of the service road, was again plowed and sown to blue grass. Between January 5 and March 12 all available manure was hauled to the shrubbery beds to serve as a mulch as well as a fertilizer. Later in the spring this was spaded under and the beds thoroughly watered. The benefit of this practice is evidenced by the low mortality rate of plants in the area so handled.

Construction.—Important items of construction during the year include the building of a ramp to replace the steps formerly at the entrance to the floral display house. The construction of this ramp necessitated rather extensive changes in the sewers and roads in the immediate vicinity. The inadequate parking lot near the experimental greenhouse was closed, and a larger area, provided with a cinder base, was set aside near the stone barn. The changes previously referred to in the cactus and coffee houses required the building of rock and brick retaining walls and the removal and return of nearly seventy loads of soil. During the year over two hundred loads of

compost and leaves were shredded into the storage bins and later hauled away as needed.

Painting and Repairs.—More extensive painting operations have been carried on during 1934 than for any recent year. At the heating plant all equipment including boilers, pumps, steam lines, and valve chambers were painted. The following have received one or more coats of paint: service buildings, equipment, the engineer's house and the Cleveland Avenue lodge, doorways at the old residence, doors of all greenhouses, drinking fountains and benches, 2,000 label holders, entire exterior and interior of experimental greenhouse and considerable portions of all the houses in the main range of conservatories and floral display range, as well as all the iron balconies and the iron fence on Tower Grove Avenue from Magnolia to the main entrance. The most important item of repair was replacing the high-pressure steam line in the valve chamber and rearrangement of the coils in certain houses to permit of a greater range of temperature. A new pump was also installed in the steam tunnel. The repairing of broken water connections and clearing up of clogged sewers, usually caused by roots, has been a considerable item of expense. Much work on the roofs of various buildings has been necessary, as well as the replacement of many basement window frames which had disintegrated from long years of service.

ATTENDANCE FOR 1934
(Recording turnstile count)

	Week-days	Sundays
January	5,870	5,547
February	13,053	9,928
March	9,049	10,229
April	13,603	20,635
May	15,289	11,297
June	15,225	5,909
July	14,112	7,032
August	16,105	9,836
September	13,893	16,254
October	20,086	26,959
November	35,230	44,357
December	6,274	9,272
	177,789	177,255
		177,789
Total		355,044

THE ARBORETUM

The seed-beds and nurseries continue to expand. Some 2,400 square feet of beds and frames were added during the past year in spite of the fact that over 2,000 young trees and shrubs were moved from the beds into nursery rows. Approximately 1,000 trees and shrubs were moved from the nursery into permanent locations on various parts of the grounds. Three hundred conifers were added to the pinetum, and 200 large pines and 25 junipers were shifted to other positions. Throughout the dry summer it was necessary to water almost constantly newly planted trees and shrubs, as well as the young nursery stock. The loss in this material was negligible, but practically none of the small seedlings could be saved. The apple, flowering cherry, and flowering crab orchards could not be watered, but they were regularly pruned, sprayed, cultivated, and mulched, and no serious damage from the drought resulted.

An important item of construction was the excavation and pouring of the foundation walls for the structure at the new entrance, which is to comprise reception and rest rooms, keeper's cottage, and garage. A driven well 560 feet deep was completed at this location, and will not only furnish an abundant supply of water at the entrance but will also serve as a resource in filling the lake if ever that becomes necessary. Some 400 loads of gravel were hauled from the river bed and used for concrete work at the gateway and for resurfacing roads.

Because of the difficulty in handling the crowds which now come to see the orchids, the house, including the rockery where they have been displayed, was doubled in size. It is now possible for visitors to pass through the exhibit without doubling back, and the orchids can now be shown to much better advantage. Nearly 20,000 flowers were displayed during the past year either in this greenhouse or at the city garden. Approximately the same number of plants were repotted.

Additions of Missouri Plants to Wild Flower Area.—In continuation of the plan to increase the representations of native plants at the Arboretum, the plant collector, besides augmenting considerably the number of species already established, has secured either seeds or plants of the following genera:

Aesculus
Amorpha (2 species)
Artemisia
Buchloë
Buffalo Grass
Carya (3 species)
Cassia (3 species)
Cornus
Crataegus (6 species)
Fagus
Helianthus
Liatris
Malus
Melothria
Nyssa
Quercus (11 species)
Rosa (2 species)
Salvia
Smilax

About one hundred additions were made to the herbarium of Missouri plants.

Orchids.—Last year the blooming of seventeen hybrid orchids grown from seed was recorded. During this year ten additional hybrids have bloomed, and as the number increases from year to year it should be possible to gradually eliminate the less desirable forms until eventually, while the number will not be greatly increased, the quality of flowers in the collection will be far superior to those formerly grown.

PARENTAGE	DATE GERMINATED	DATE FLOWERED
Cattleya intermedia alba × *C. Skinneri alba*	June 1, 1928	May 9, 1934
Cattleya "Enid" *alba* × *C. speciosissima Stanleyi*	May 2, 1929	July 6, 1934
Dendrobium Phalaenopsis, light × *D. Phalaenopsis*, light	June 3, 1929	July 9, 1934
Cattleya Fabia × *Laeliocattleya* "Black Prince"	June 1, 1928	Oct. 25, 1934
Cattleya "Harold" × *C. Hardyana*	March 7, 1928	Jan. 3, 1934
Cattleya Fabia × *C. amabilis*	Nov. 10, 1928	Sept. 5, 1934
Cattleya Trianae × *Laeliocattleya* "Serbia"	Feb. 23, 1928	Nov. 10, 1934
Cattleya amabilis × *C. Fabia*	Nov. 1, 1928	Sept. 25, 1934
Cattleya Trianae × *Laeliocattleya Jacquinetta*	March 6, 1929	Oct. 10, 1934
Cattleya Trianae × *C. Trianae*	March 25, 1927	Nov. 21, 1934

Camp for Homeless Men.—In cooperation with the Citizens' Committee on Relief and Employment, there was established towards the end of August a camp for young men who were unable to find employment in the city. The old cattle barn was remodeled into a very comfortable barracks, and while the number taking advantage of this opportunity has not been so great as anticipated, the results have been most satisfactory.

After planting about 100,000 narcissus bulbs in the pinetum, this group began clearing for the system of new roads which eventually will make it possible to open the grounds to the public.

Henry Shaw Gardenway.—Through action of the county courts of St. Louis County and Franklin County, that part of Highway 66 from the city limits to the entrance to the Arboretum at Gray Summit has been designated as the Henry Shaw Gardenway. The association, formerly known as the Watson Antire Regionway Improvement Association, has changed its name to the Henry Shaw Gardenway Improvement Association. Through its various committees it is actively engaged in carrying out the improvement of the right-of-way with adjacent land, so that eventually this gardenway will present an attractive collection of native blooming shrubs and trees and will be a worthy memorial to the man whose name it bears. The following editorials indicate the appreciation with which this action has been received:

HENRY SHAW GARDENWAY

"The County Court has done well to follow the recommendation of the St. Louis County Plan Association and Dr. George T. Moore in naming U. S. Highway 66 to Gray Summit. Nothing could be more fitting than Henry Shaw Gardenway. The Missouri Botanical Garden is at one end of the strip and its beautiful arboretum is taking form at the other end. With these institutions promising their cooperation in the beautification of the length of it, there can be no doubt that a gardenway in fact as well as in name will exist in the not-far-distant future. And it is high time that the full name of St. Louis' great benefactor be preserved in some public way. A modest man, who expressly stipulated that his garden should not bear his name officially, he has never received the recognition that is his due. A lovely and suggestive addition has been made to the community's highway nomenclature. It should be welcomed with prompt usage."—*St. Louis Post-Dispatch*, June 9, 1934.

AT LAST A SHAW MEMORIAL

"About the only official recognition the City of St. Louis ever gave Henry Shaw was to collect taxes on the botanical gardens he endowed for public use and to name a street for him through what was once his land. Now that the St. Louis County Board has adopted the suggestion of the County Plan Commission and given the name 'Henry Shaw Gardenway' to that portion of Highway 66 within the county limits, it would be a fitting honor if the city could lead this 'Gardenway' into town, and perhaps to the gateway of the old

Shaw's Garden Henry Shaw knew and loved, by changing the name of one or two streets.

"Highway 66 enters the city on Chippewa Street. That name has virtually no historical significance here because the Chippewa Indians were not a Missouri tribe. If there is going to be a Henry Shaw Gardenway it ought to lead, not only to the new Shaw arboretum at Gray Summit, but to the Shaw's Garden in the city, which most of the public sees and associates with Henry Shaw's name.

"Possibly the Franklin County Board will pay the same honor to this road inside the Franklin County line. With the promised beautification of the route by the Garden itself, that would make a 40-mile memorial boulevard, of which both counties and the city could be proud."—*St. Louis Star*, June 6, 1934.

In this connection, the Garden has made available land on which to establish nurseries for the State Highway Department where material can be matured not only for Highway 66, but other highways in the state. A satisfactory start has been made towards getting the ground in shape, and collecting native material for establishment next spring.

HOURS OF SUNSHINE RECORDED IN 1934

Month	City Garden	Arboretum
January	117	121
February	130¾	165
March	173½	190
April	227	235
May	286	288½
June	261¼	301½
July	282	298½
August	228	233¾
September	146½	166
October	239½	250
November	140¾	160
December	89¾	94
	2322	2503¼
		2322
Excess at Arboretum.....		181¼

TROPICAL STATION, BALBOA, C. Z.

Many short exploration and collecting trips have been made throughout the year by the manager and his assistant. These have covered both sides of the Chagres River Valley, at a distance from the river, the valley of the Chilibrillo for several miles on both sides, and the valleys of the Tecumen, Cobre, and

Pecora Rivers, as well as a number of smaller valleys. These valleys are densely grown with jungle and difficult to work, but a large field of Peristeria was found and many good specimens added to the collection. Due to the activities of collectors and cut-worms many varieties formerly plentiful are now practically exterminated. The more rugged parts of the country west and north of the Campana Mountains yielded better results, but here the trails are extremely rough and steep and progress is slow. The showy white Sobralias are found growing on almost perpendicular cliffs of volcanic ash directly over the rivers. In spite of these difficulties several clumps of this orchid have been added to the collection this year. Other notable additions were *Oncidium carthaginense*, Stanhopea, Aspasia, Hexisia, Trichopilia, Cattleya, Cleistes, Cycnoches, Gongora, Lycaste, Masdevallia, Mormodes, Paphiopedilum, Bletia, and Peristeria.

The routine work of the Station has been mainly concerned with the care of the plants and it has been a very successful year as regards quality and quantity of bloom. A list of the plants which have flowered would include practically every species listed for Panama. The weather has been normal and not so much difficulty has been encountered in the control of insect pests as in previous years.

ANNUAL BEQUESTS

The annual flower sermon "On the wisdom and goodness of God as shown in the growth of flowers, fruits, and other products of the vegetable kingdom," provided for in the will of Henry Shaw, was preached at Christ Church Cathedral on April 15, by the Right Rev. George Craig Stewart, D.D., Bishop of the Diocese of Chicago.

The Trustees' Banquet Fund, inaugurated under the will of Henry Shaw, was not drawn upon during 1934.

The Gardeners' Banquet Fund was drawn upon at Christmas time for the provision of turkeys for some of the employes of the Garden.

The fund for the provision of prizes at flower shows was not used this year.

In addition to the Henry Shaw Gardenway, another memorial to Mr. Shaw was provided by the Junior Chamber of Commerce of St. Louis. To mark the site of Mr. Shaw's city residence at the corner of Seventh and Locust Streets, a water-color painting, properly protected, showing the house in which he lived was dedicated on the anniversary of his birth July 24. As in previous years a memorial wreath was placed in the mausoleum at the Garden on August 25, the anniversary of Mr. Shaw's death.

RESEARCH AND INSTRUCTION

The only change in the staff during the year has been the appointment of Dr. David C. Fairburn as Research Assistant.

Dr. J. M. Greenman, Curator of the Herbarium and Professor in the Henry Shaw School of Botany of Washington University, in addition to curatorial duties, has directed as usual the research work of graduate students in taxonomy and has given advanced courses in morphology and taxonomy, and in plant geography. He has also continued special research in taxonomy and has advanced the preparation of manuscripts for works which have been for some time in progress.

Dr. C. W. Dodge, Mycologist to the Garden and Professor in the Henry Shaw School of Botany of Washington University, and Dr. S. M. Zeller, Professor of Plant Pathological Research, Oregon State College, have completed their joint researches on the Hymenogasteraceae, studying all the material available and correlating it with their previous researches begun while they were both graduate students at the Garden in 1916. The completion of this work was made possible by a grant from the Science Research Fund of Washington University which enabled Dr. Zeller to spend January and February in St. Louis. Extensive collections of lichens by E. P. Killip and others from Colombia and Peru have been studied in continuation of Dr. Dodge's work on tropical American lichens, and the manuscript of Part 2 dealing with the Stictaceae and Peltigeraceae is nearing completion. The usual courses in mycology have been given. Since the resignation of Dr. Roland V. LaGarde, the undergraduate course in bacteriology has been

offered by Dr. Dodge and the laboratory work in the course transferred from the School of Medicine to the mycological laboratory at the University.

Owing to the completion of Madden Dam and the consequent creation of a drowned jungle in the Madden Lake region of the Canal Zone, a botanical expedition left for this locality in November. Dr. Dodge is in charge and was accompanied by Dr. Julian A. Steyermark, a former Rufus J. Lackland Fellow, and Mr. Paul Allen, a Garden apprentice. The trip is being financed by the Science Research Fund of Washington University in cooperation with the Garden. This expedition has its headquarters at the Tropical Station of the Missouri Botanical Garden in Balboa, C. Z., but at last reports had established a camp at the Salamanca Hydrographic Station on the northern arm of the Lake formed by the drowned valley of the Rio Pequeni and its tributaries. The Station is in the center of the most extensive area of drowned forest and gives easy access by native dugout canoes to the flora of the undisturbed tree tops, a section of the jungle never before easily accessible for study. Since the lianas and trees will be killed by the permanent raising of the water level, this opportunity is unique. Many of the epiphytes, especially the aroids, will also die as the trees lose their leaves, while some of the xerophytic bromeliads and orchids will probably persist for several years. Later the camp will be moved to the Hydrographic Station on the Rio Indio which will give access to the drowned valleys of the Puente, Indio, and Chagres Rivers by cayuca. The telephone trails to more distant stations will give access to the mountain forests of these river basins above the lake. Large amounts of material are being collected, but at the present time it is impossible to summarize the scientific results of the expedition.

Dr. E. S. Reynolds, Physiologist to the Garden and Associate Professor in the Henry Shaw School of Botany of Washington University, has continued the study of tree temperatures through the year, including the period of exceptional conditions last summer. A final report of this phase of the problem is in preparation in which it will be apparent that very material differences between air temperatures and those in a tree

may be maintained, and that such divergences are more marked when exceptionally high air temperatures prevail. A critical review of investigations on the effects of ultra-violet radiations upon respiration in plants and animals has been prepared for publication. This will be followed by two other papers on the same subject, detailing investigations completed during the year. Further studies also upon the effects of ultra-violet on growth and various other physiologic processes have been made or are in progress. Classes in elementary and advanced plant physiology have been carried as usual, together with the supervision of the investigations of graduate students.

Dr. Robert E. Woodson, Jr., Research Assistant to the Garden and Instructor in the Henry Shaw School of Botany of Washington University, has been in charge of the courses in elementary botany, elementary plant morphology, microtechnique, plant anatomy, research in morphology, also a course in University College of Washington University, elementary morphology and taxonomy. Taxonomic studies in the families Apocynaceae, Asclepiadaceae, and Gentianaceae have constituted Dr. Woodson's personal research work for the year.

Dr. Morris Moore and Dr. F. Lyle Wynd have assisted in the research work of Dr. Dodge and Dr. Reynolds, by means of grants from the Science Research Fund provided by the Rockefeller Foundation.

Dr. Earl E. Berkley, American Creosoting Company Fellow in the Henry Shaw School of Botany and the department of civil engineering of Washington University, has continued his study on the strength and structure of southern pine wood. With Asst. Prof. A. W. Brust, of the civil engineering department, a paper on "The distribution and variation of certain strength and elastic properties of southern yellow pine wood," has been prepared and is now in manuscript form Data on the relation of the cell wall structure to the shrinkage of wood is being organized for publication. In cooperation with Prof. Brust also he is now working on the relation of structure and tensile strength of southern pine wood. During the month of June a trip to West Virginia to study the grasses of that region was made. The illustrations for about

200 species are now completed and the manuscript is being prepared.

Graduates and Fellows.—The following appointments were made in the Henry Shaw School of Botany for the year 1934-35:

Assistants in Botany (half-time assistant): John Adam Moore, Ph.D., Washington University; (half-time graduate students): Fred Alexander Barkley, A.B. and M.S., University of Oklahoma, Norman, Okla. (Taxonomy and Anatomy); Mary Maxine Larisey, A.B. and M.S., Washington University (Taxonomy and Anatomy).

Washington University Fellowship: Louis Otho Williams, A.B. and M.S., University of Wyoming, Laramie, Wyo. (Taxonomy and Anatomy).

Jessie R. Barr Fellowship, Washington University: Gladys Elizabeth Baker, A.B., University of Iowa, Iowa City, Ia. (Mycology and Taxonomy).

Washington University Scholarship: Mary Elizabeth Pinkerton, B.S., University of Nebraska, Lincoln, Neb., M.S., Washington University (Mycology and Morphology).

Washington University Van Blarcom Scholarship: Helen Marie Bramsch, A.B., Washington University (Plant Anatomy and Zoology).

Special Research Fellowship, American Creosoting Company: Earl Esco Berkley, A.B., University of West Virginia, Morgantown, W. Va., M.S. and Ph.D., Washington University.

Independent Students: Noel Moore Ferguson, B.S., St. Louis College of Pharmacy, A.B., Washington University (Physiology); George Bippus Happ, B.S., Cornell University, Ithaca, N. Y. (Taxonomy); Bernard Smith Miller, B.S. in Education, Baker University, Baldwin, Kansas (Physiology).

Degrees.—The following graduate students in the Henry Shaw School of Botany received advanced degrees at the Washington University commencement, June 12, 1934: Doctors of Philosophy—John Adam Moore and Ward McClintic Sharp; Master of Science—Mary Maxine Larisey and Joseph Connie Moore.

Apprenticeships.—The apprenticeship system now in vogue is a continuation of the "instruction to gardeners" provided for by Mr. Shaw and inaugurated forty years ago. Of the various methods tried this has proved to be most satisfactory, since it meets a demand not usually provided for by more technical instruction and concerned more with theory than actual practice.

Apprentices now enrolled are: Paul H. Allen, Wilbert Quest, and Littleton Rubinstein. August A. Knoll graduated during the year and received the certificate for satisfactory completion of the work.

As in previous years the lecture and demonstration course in gardening for amateurs was given from January to April with a capacity registration. A second course of a more advanced character was given during 1934 for the first time and proved as popular as the elementary course.

Published Articles.—

Beilmann, August P. Experiments on the Fertilization of Shade Trees. Nat. Shade Tree Conference, Proc. **10**: 114–120. 1934.

Beilmann, August P. How to Feed a Shade Tree. Mo. Bot. Gard. Bull. **22**: 113–126. April, 1934.

Beilmann, August P. Nut Trees in the Garden. Mo. Bot. Gard. Bull. **22**: 147–149. June, 1934.

Beilmann, August P. Old Trees in the Garden. **22**: 146–147. June, 1934.

Beilmann, August P. Semi-evergreen Trees. Mo. Bot. Gard. Bull. **22**: 133–134. May, 1934.

Berkley, Earl E. Certain Physical and Structural Properties of Three Species of Southern Yellow Pine Correlated with the Compression Strength of Their Wood. Ann. Mo. Bot. Gard. **21**: 241–338. 1934.

Berkley, Earl E. *Poria Cocos* (Schw.) Wolf, Found on a Railroad Tie in Service. Ann. Mo. Bot. Gard. **21**: 339–342. 1934.

Cutak, Ladislaus. Reprint of "Carrion Flowers" from Mo. Bot. Gard. Bull. Garden Digest **6**[3]: 21–22. March, 1934.

Cutak, Ladislaus. The Passing of the Saguaro (*Carnegiea*

gigantea) at the Garden. Mo. Bot. Gard. Bull. **22**: 185–186. October, 1934.

Cutak, Ladislaus. A Plant that Looks like a Rock. Mo. Bot. Gard. Bull. **22**: 197–199. December, 1934.

Cutak, Ladislaus. Succeeding with Succulents Indoors. "In the Garden World" column of New York Times. December 2, 1934.

Cutak, Ladislaus. Summer Care of Cacti. Mo. Bot. Gard. Bull. **22**: 134–136. May, 1934.

Cutak, Ladislaus. *Talinum calycinum* from the Midwest. Desert **6**: 52–53. August, 1934.

Cutak, Ladislaus. Talinums—Lovely Gems for Our Rock Gardens. Garden Gossip **9**: 3. November, 1934.

Cutak, Ladislaus. The Wax-plant. Mo. Bot. Gard. Bull. **22**: 176–178. October, 1934.

Darlington, Josephine. A Monograph of the Genus Mentzelia. Ann. Mo. Bot. Gard. **21**: 103–226. 1934.

Dodge, Carroll W. Contribucion al Conocimento de la Evolucion de los Gasteromycetos. Rev. Sudamericana de Bot. **1**: 18–20. 1934.

Dodge, Carroll W. (with Sanford M. Zeller). Hymenogaster and Related Genera. Ann. Mo. Bot. Gard. **21**: 625–708. 1934.

Dodge, Carroll W. Proposals for Amendment of Article 20 of the International Rules of Nomenclature. Ann. Mo. Bot. Gard. **21**: 709–712. 1934.

Fairburn, David C. Artificial Light and Plant Growth. Mo. Bot. Gard. Bull. **22**: 145–146. June, 1934.

Fairburn, David C. Economic Uses of Plant Sap. I. Sugar. Mo. Bot. Gard. Bull. **22**: 199–204. December, 1934.

Fairburn, David C. Experiments on Gladiolus. Mo. Bot. Gard. Bull. **22**: 178–181. October, 1934.

Fairburn, David C. Growth Responses of the Gladiolus as Influenced by Storage Temperature. Iowa Agr. Exp. Sta. Research Bull. No. 170: 95–123. 1934.

Fairburn, David C. Some New and Noteworthy Narcissus. Mo. Bot. Gard. Bull. **22**: 173–176. October, 1934.

Goodman, George J. A Revision of the North American

Species of the Genus Chorizanthe. Ann. Mo. Bot. Gard. **21**: 1–102. 1934.

Jensen, Lars P. Arboricultural Development in the Missouri Botanical Arboretum. Meramec Valley Transcript.

Jensen, Lars P. Identifying Woody Plants in Winter. (Condensed from Parks and Recreation.) Garden Digest **6**[1]: 35–36. January, 1934.

Jensen, Lars P. Protect Wild Flowers. Missouri Magazine **6**[12]: 1934.

Jensen, Lars P. Tree Curiosities at the Arboretum. Mo. Bot. Gard. Bull. **22**: 147. June, 1934.

Kohl, Paul A. Growing Plants from Seed. Mo. Bot. Gard. Bull. **22**: 153–168. September, 1934.

Moore, Morris. A New Geotrichum from a Bronchial and Pulmonary Infection, *Geotrichum versiforme* Moore, n. sp. Ann. Mo. Bot. Gard. **21**: 349–366. 1934.

Moore, Morris. *Posadasia pyriformis* and *P. capsulata*, Two Causative Agents of Darling's Histoplasmosis in the United States. Ann. Mo. Bot. Gard. **21**: 347–348. 1934.

Pring, George H. The Amazon Water-lily (*Victoria Cruziana*). Mo. Bot. Gard. Bull. **22**: 108–110. 1934.

Pring, George H. Hybrid Nymphaeas. Mo. Bot. Gard. Bull. **22**: 47–90. February, 1934.

Pring, George H. Hybrid Nymphaeas—Their Creation, Propagation and Cultivation. Mo. Bot. Gard. Bull. **22**: 93–108. March, 1934.

Pring, George H. Leaf Propagation. (Extract from Mo. Bot. Gard. Bull.) Garden Digest **6**[6]: 22. June, 1934.

Steyermark, Julian A. *Epifagus virginiana* in Missouri. Rhodora **36**: 352–353. October, 1934.

Steyermark, Julian A. A Grass New to Missouri. Rhodora **36**: 313. September, 1934.

Steyermark, Julian A. *Hamamelis virginiana* in Missouri. Rhodora **36**: 97–100. March, 1934.

Steyermark, Julian A. Range Extension in Missouri for *Ophioglossum vulgatum*. Rhodora **36**: 22–23. January, 1934.

Steyermark, Julian A. Recent Additions to the Flora of St. Louis County, Missouri. Rhodora **36**: 375–376. October, 1934.

Steyermark, Julian A. Some features of the Flora of the Ozark Region in Missouri. Rhodora **36**: 214–232. June, 1934.

Steyermark, Julian A. Studies in Grindelia. I. New Species, Varieties, and Combinations of Grindelia. Ann. Mo. Bot. Gard. **21**: 227–230. 1934; *Ibid.* II. A Monograph of the North American Species of the Genus Grindelia. Ann. Mo. Bot. Gard. **21**: 433–608. 1934.

Williams, Louis O. Field and Herbarium Notes. II. Bull. Torr. Bot. Club **61**: 259–262. 1934; *Ibid.* III. Ann. Mo. Bot. Gard. **21**: 343–346. 1934.

Williams, Louis O. Notes on Rocky Mountain Plants. I. Leaflets West. Bot. **1**: 129–133. 1934.

Woodson, Robert E., Jr. Apocynaceae, in G. Cufodontis, Risultati della Spedizione Biologica Austriaca in Costarica nel 1930. Archivio Bot. **10**: 14–17. 1934.

Woodson, Robert E., Jr. Apocynaceae and Asclepiadaceae, in A. Rehder, Notes on the Ligneous Plants Described by Léveillé from Eastern Asia. Jour. Arn. Arb. Harvard Univ. **15**: 310–318. 1934.

Woodson, Robert E., Jr. New or Otherwise Noteworthy Apocynaceae of Tropical America. IV. Ann. Mo. Bot. Gard. **21**: 613–623. 1934.

Woodson, Robert E., Jr. Two New Asclepiads from Szechuan, China. Ann. Mo. Bot. Gard. **21**: 609–611. 1934.

Wynd, F. Lyle. The Effects of Increasing the Iodine Content of the Tomato Plant on Respiration and Enzymatic Activity. Ann. Mo. Bot. Gard. **21**: 367–432. 1934.

Scientific and Popular Lectures.—

August P. Beilmann, Arboriculturist to the Garden: August 30, National Shade Tree Conference, at Pittsburgh, "Experimental Tree Feeding"; September 28, Webster Groves Rotary Club, "The Care of Trees."

Ladislaus Cutak, in Charge of Exotics: February 2, St. Louis Horticultural Society, "Cacti"; September 19, Alhambra Grotto, Wednesday Dinner Club, "Cacti in the Home."

Carroll W. Dodge, Mycologist to the Garden: March 12, Webster Groves Nature Study Society, "Lichens"; April 3,

Washington University Association lecture, "Costa Rica, the Land of Coffee and Bananas."

David C. Fairburn, Research Assistant at the Garden: March 28, Belleville Garden Club, Belleville, Ill., "Fertilizers and Seed Sowing."

Jesse M. Greenman, Curator of the Herbarium: April 25, St. Louis Academy of Science, "Thomas Nuttall and the Wyeth Expedition."

Lars P. Jensen, Manager of the Arboretum: January 24, Alhambra Grotto Wednesday Dinner Club, "Henry Shaw and the Missouri Botanical Garden"; February 6, Garden Club of Sullivan, Mo., "Planning and Planting the Garden"; March 2, Parent-Teachers' Association of the Sappington School, Sappington, Mo., "Planning and Planting the Home Grounds"; March 5, Garden Club of Gray Summit, "Pruning of Ornamental Trees and Shrubs"; March 12, Parent-Teachers' Association of the Union School, Union, Mo., "Gardening as a Hobby"; March 26, Midland Valley Garden Club, at Overland, Mo., "Planning and Planting the Home Grounds"; May 9, Hub Club, at Rolla, Mo., "Missouri Botanical Garden Arboretum," and Rolla Garden Club, "Landscape Gardening"; May 19, Cape Girardeau Garden Club, "Missouri Botanical Garden Arboretum"; May 26, St. Louis Wild Flower Club, "Roadside Planting and Improvement"; June 12, Citizens' Road Association, Jefferson City, "Roadside Improvement"; at dedication of planting at Franklin County Courthouse, Union, Mo., "The Value and Importance of the Planting of Public Grounds"; September 30, Garden Clubs of Overland and Gray Summit, Mo., at Gray Summit, "The Missouri Botanical Garden."

John H. Kellogg, Plant Collector to the Missouri Botanical Garden: March 27, radio talk for the Community Council over Station KWK, "Missouri Trees."

Paul A. Kohl, Floriculturist to the Garden: January 18, St. Clair Garden Club, Signal Hill, Ill., "The Rock Garden"; January 26, Webster Groves Home Garden Club, "Spring Gardening"; April 11, Group 6 of the Webster Groves Home Garden Club, "The Iris"; May 4, St. Louis Horticultural So-

ciety, "Gardens of the Pacific Northwest"; May 21, Alpha Delphian Society of St. Louis, "Iris, Peonies, and Roses"; October 17, Garden Club of Ferguson, Mo., "Bulbs"; November 5, Council of Jewish Women, "Preparing the Garden for Spring Planting and Winter Protection."

George T. Moore, Director of the Garden: March 7, Men's Club of the Church of St. Michael and St. George, "A Respect for Plants"; March 23, Glendale Garden Club, at Kirkwood, "Plants and People"; April 10, Brotherhood of Pilgrim Congregational Church, "Plants and People"; April 22, chapel address to students of Girard College, Philadelphia; September 10, Lake and Valley Garden Club, at Cooperstown, New York, "Some Inside Facts About Plants—and the Missouri Botanical Garden"; October 16, Garden Club of St. Louis, "Mysteries of the Underworld, or What Goes on Underground"; November 13, Kirkwood Garden Club No. 2, "The Life of the Plant."

George H. Pring, Superintendent of the Garden: January 8, Gray Summit Garden Club, "City Gardens"; January 15, Des Moines Garden Club, at Des Moines, Iowa, "The Cultivation and Breeding of Water-lilies"; January 26, Federation of Improvement Associations of St. Louis, "Plant Curiosities"; February 16, Practical Arts Club of College Women, "Annuals and Perennials"; February 28, Science Section of the Wednesday Club, "Breeding Tropical Water-lilies"; March 5, Monday Circle, "Plant Exploration"; April 3, Wydown Men's Club, First Congregational Church, "Planting City Gardens"; April 11, St. Clair Garden Club, Belleville, Ill., "Breeding of Tropical Water-lilies"; April 27, Professional Women's Club of the Second Presbyterian Church, "Orchid Exploration"; May 2, Emerson School Mothers' Club, "Water-lilies"; May 4, Rotary Club of Webster Groves, "Plant Curiosities"; May 7, Women's Advertising Club of St. Louis, "Orchid Exploration"; May 25, Mid-West Horticultural Society, Chicago, "Orchid Exploration"; September 9, radio talk over Station KSD, "The Effect of Drought and Heat on Plants"; September 27, Rotary Club at Fulton, Mo., "Economic Plants"; September 27, in the evening, public

meeting of the garden clubs, at Fulton, Mo., "Plant Exploration"; October 3, Scottish Rite Women's Clubs, "City Gardens"; October 24, Garden Club of Greenville, Ill., "City Gardens" October 29, Associated Garden Clubs of Kansas City, "Water-lilies and Garden Pools"; November 2, St. Louis Horticultural Society, "Evolution of the Cultivated Chrysanthemum"; December 12, Cemetery Superintendents' Association, "Effect of Drought on Plants."

Hermann von Schrenk, Pathologist to the Garden: January 24, joint meeting of the Houston Engineers' Club, South Texas Chapter of the American Institute of Architects, Rice Institute Engineering Society, and the American Wood Preservers' Association, "Termites and Methods for Combating Them"; January 25, annual meeting of the American Wood Preservers' Association, at Houston, Texas, "Opportunities for Marketing Ready-to-Use Treated Material"; September 10, American Association of Port Authorities, at New York, "Marine Borers"; October 31, Illinois Chapter of the American Society of Civil Engineers, at Urbana, "Timber."

HERBARIUM

Work in the herbarium has gone forward steadily during 1934, much as in previous years. While no one exceptionally large unit has been obtained, yet important collections have been acquired; and most of the new material has been mounted and incorporated in the general herbarium.

Several generous gifts of plants have been received, notably one from Mr. Charles F. Batchelder of an excellent series of perfectly prepared specimens representing particularly the flora of New England; and a second collection of about equal size has been presented by Mr. Leo A. Hanna, representing primarily the flora of Wyoming, Colorado, and Utah.

The larger accessions of the year are the following: Academy of Natural Sciences, Philadelphia, 418 plants, mostly Scrophulariaceae from eastern United States; Arnold Arboretum of Harvard University, 453 plants of the United States, mostly from the collections of Mr. Ernest J. Palmer; F. A. Barkley, 80 plants of Oklahoma, Texas, and Mississippi; Charles F.

Batchelder, 810 plants, mostly from New England; Bernice Pauhi Bishop Museum by Harold St. John, 192 plants of Washington and Idaho; Mrs. H. P. Bracelin, 854 plants from Brazil; Brooklyn Botanic Garden, 80 plants from eastern United States; B. F. Bush, 1,416 plants from Missouri, Kansas, and Texas; California Academy of Sciences, 122 plants of the Pacific Coast region and the Galapagos Islands; Mrs. Rose E. Collom, 218 plants of Arizona; Otto Degener, 406 plants of the Hawaiian Islands; Delzie Demaree, 312 plants of Ohio; H. A. Gleason, 1,000 plants of Brazil; Gray Herbarium of Harvard University, 87 plants of Greenland, Brazil, etc., also 200 photographs of type and authentic specimens of the Bromeliaceae; Leo A. Hanna, 884 plants, mostly from Wyoming, Colorado, and Utah; Roland M. Harper, 177 plants of Alabama; Bertrand Harrison, 400 plants of Utah; F. J. Hermann, 130 plants of eastern and central United States; G. Herter, 86 plants of Uruguay; John H. Kellogg, 133 plants of Missouri; Esther L. Larsen, 197 plants of Delaware; C. L. Lundell, 564 plants of British Honduras; W. Migula, 175 cryptogams of Europe; New York Botanical Garden, 199 plants of the United States; Pomona College, 250 plants of California, Oregon, etc.; Rocky Mountain Herbarium, 685 plants from the Rocky Mountain region; H. J. F. Schimpff, 145 plants from the Galapagos Islands and Ecuador; William A. Schipp, 138 plants of British Honduras; Dr. Francis G. Scully, 115 plants of Arkansas; State College of Washington, 100 plants of Washington; Julian A. Steyermark, 1,247 plants, mostly from Missouri; H. Sydow, 250 fungi of Europe, etc.; J. William Thompson, 1,055 plants of Washington; United States National Museum, 389 plants of North and South America; University of California, 722 plants of China and 220 plants of western United States; University of California at Los Angeles, 199 plants of California and Lower California; University of Michigan by F. J. Hermann, 104 plants of Michigan and Indiana; University of Minnesota, 106 plants of Minnesota; University of Missouri, 210 plants of Missouri, etc.; University of Texas, 161 plants of Texas; Fr. Verdoorn, 100 hepatics and mosses; Theo. Oswald Weigel, 320 plants of South America, Europe, etc.;

L. O. Williams, 797 plants chiefly from Wyoming and Oregon; R. E. Woodson, Jr., 117 plants and photographs, mostly of the Apocynaceae. Numerous smaller collections have been received, all of which have been recorded in current numbers of the MISSOURI BOTANICAL GARDEN BULLETIN for 1934.

This enumeration shows that the additions to the herbarium during the year have been numerically and geographically in the following order: the western and southwestern United States, the Mississippi Valley region, and the eastern United States; but at the same time the Garden's representation of the flora of South America, Central America, Asia, Europe, and the islands of the Pacific has been substantially augmented.

Mounting and Insertion of Specimens.—The mounting of new material has continued uninterruptedly throughout the year and has kept almost apace with the new accessions. Sixteen thousand, seven hundred and fourteen (16,714) specimens have been mounted and incorporated in the general herbarium.

All new material has been twice fumigated with carbon disulphide before incorporation in the herbarium. This procedure has been followed meticulously for several years as a precautionary measure against insect attack; it has proven very satisfactory, especially when combined with a deterrent such as flaked naphthaline or with para-dichlorbenzene. The use of steel cases, thorough fumigation, and a close watch over the entire collection have eliminated practically all trouble with herbarium insect pests.

The reorganization of material in the herbarium in accordance with the best floristic publications, monographs, and current new literature, has continued as time permitted for this detailed but very necessary work. It, however, is work which can be satisfactorily carried on only when regular classes are not in session, when room and table-space are available, and when consecutive time can be devoted to the task.

Exchanges.—Upwards of 1,000 duplicate herbarium specimens have been distributed to American and foreign herbaria during the year. This number is relatively small; but duplicate plant material from one of the large private collections,

purchased several years ago, is being laid out in sets and a general distribution of it is planned for 1935.

Field Work.—No extensive botanical expeditions have been made during the year, yet some local field collecting has been done. Many novelties have been secured for the herbarium, and some new records have resulted from this source. Graduate students have contributed in no small measure to the additions made to the herbarium during the year, as well as in previous years.

Use of the Herbarium.—The use of the herbarium is being extended annually. Botanists from various parts of our own country and from foreign countries have taken advantage of a visit to the Garden to consult the library and the herbarium. Loans of herbarium specimens have been made to specialists residing in different parts of the United States and some material has been sent overseas. At the same time it has been a satisfaction and of material advantage to be able to borrow study material from American and from foreign institutions. This has contributed greatly to the research work in taxonomy for members of the staff and for the graduate students.

Statistical Summary (for the year ending December 31, 1934):

Number of speciments acquired on new accessions:			
By purchase	8,643		
By gift	3,145		
By exchange	5,528		
By transfer	8		
Total	17,324	valued at	$2,165.50
Number of specimens mounted and incorporated	16,714	valued at	3,342.80
Number of specimens discarded from the herbarium	107	without value	
Number of specimens in organized herbarium	1,064,571	valued at	$174,450.30
Number of specimens in unorganized herbarium	101,525	valued at	10,550.40
Wood specimens, etc., in herbarium		valued at	280.00
Microscope slides		valued at	360.00
Total valuation			$185,640.70

LIBRARY

The number of books and pamphlets acquired during 1934 was normal and the normal amount of money was expended, but none of the purchases was particularly outstanding. The currency situation was such that prices for foreign books were practically doubled and the entire library appropriation was needed for maintaining the serial collections and for purchasing current botanical works. Perhaps the most noteworthy accessions were the forty missing volumes of "Repertorium specierum regni vegetabilis—Beihefte" and of the "Bulletin de la Société Linnéenne de Normandie." According to a foreign book agent, the Garden library is one of the few which has been able to keep up its periodical file throughout the depression. That this is appreciated is evidenced by the greater number of institutions which have borrowed books on the interlibrary loan plan during the year.

During the summer work was begun on cleaning the books in the old lecture room and adding new labels where needed. The recataloguing and redistributing of the European publications according to post-war classification was begun during the year, but could not be finished because it involved shifting almost the entire library.

Use of the Library.—In addition to the staff and students of the Shaw School of Botany, the following botanists have made use of the resources of the library during the year: Dr. Constantin Alexoupolos, Instructor in Botany, University of Illinois, Urbana; Dr. A. L. Bakke, Professor of Plant Physiology, Iowa State College, Ames; Mr. J. Christian Bay, Librarian, John Crerar Library, Chicago; Mr. Richard Carpenter, graduate student, University of Oklahoma, Norman; Dr. M. A. Chrysler, Professor of Botany, Rutgers University, New Brunswick, N. J.; Dr. Clare F. Cox, Head, department of biology, Technical High School, Indianapolis; Dr. Carl G. Deuber, Assistant Professor of Plant Physiology, Yale University, New Haven, Conn.; Dr. Francis Drouet, assistant, and Mr. L. Jeffrey, student, department of botany, University of Missouri, Columbia; Dr. Thomas I. Edwards and Dr. Ralph G. Schott, of Johns Hopkins University, Baltimore; Prof. J. C.

Frazier, Assistant Professor of Biology, Illinois Wesleyan University, Bloomington, Ill.; Dr. F. M. Fryxell, Professor of Geology, Augustana College, Moline, Ill.; Dr. Harry J. Fuller, Instructor in Botany, University of Illinois, Urbana; Dr. Lake S. Gill, Associate Pathologist, Division of Forest Pathology, U. S. Department of Agriculture, San Francisco; Dr. M. L. Lohman, Division of Forest Pathology, U. S. Department of Agriculture, Asheville, N. C.; Dr. Mildred E. Mathias, Research Associate, New York Botanical Garden; Prof. Norman McClintock, photo-naturalist and lecturer, Rutgers University, New Brunswick, N. J.; Dr. Waldemar Meier, Horticulturist, of the Park Department, Berne, Switzerland; Dr. J. B. S. Norton, Professor of Systematic Botany and Mycology, University of Maryland, College Park; Dr. F. W. Pennell, Curator of Plants, Academy of Natural Sciences, Philadelphia; Dr. E. Percy Phillips, Principal Botanist, Division of Plant Industry, Pretoria, South Africa; Dr. Earl E. Sherff, Head, department of science, Chicago Normal College, Chicago; Dr. William Randolph Taylor, Professor of Botany, University of Michigan, Ann Arbor; Dr. Charles Thom, Principal Mycologist, Bureau of Chemistry and Soils, Washington, D. C.; Dr. P. A. van der Bijl, Professor of Mycology, University of Stellenbosch, South Africa; Dr. Edgar T. Wherry, Professor of Ecology, University of Pennsylvania, Philadelphia; Dr. John Wishart, of Clare College, University of Cambridge, England; Dr. S. M. Zeller, Plant Pathologist, Oregon State Agricultural College, Corvallis.

The following groups have visited the library during the year: students in botany, Moberly Junior College, Moberly, Mo., accompanied by Miss Esther Adams, Instructor in Botany; students in botany, Monett Junior College, Monett, Mo., accompanied by Miss Virgene Warbritton, Teacher of Botany; and students in horticulture, Iowa State College, accompanied by Prof. B. S. Pickett, Professor of Horticulture.

Out-of-town botanists from 26 institutions borrowed 100 books on the interlibrary-loan plan during the year.

Garden Publications.—Volume XXI of the ANNALS OF THE MISSOURI BOTANICAL GARDEN, consisting of 719 pages, 18

plates, and 87 text-figures, was published during the year. The abnormally large size of this volume is due to the fact that it contains five of the six doctoral dissertations from 1933, also the results of studies on the Hymenogasteraceae begun some years ago by Dr. S. M. Zeller, of Oregon Agricultural College, and Dr. Dodge.

The monthly BULLETIN for 1934 (Vol. XXII) was also completed and comprises 216 pages and 55 plates. The February and March numbers of the BULLETIN were devoted to the work with hybrid water-lilies and contain nineteen colored plates of the nymphaeas originated at the Garden.

Both ANNALS and BULLETIN are sent in exchange for other publications. Ten new institutions were added to the ANNALS mailing list during 1934: from China, France, Madagascar, Australia, Palestine, U. S. S. R., and Sweden. There are now 430 foreign and 126 domestic institutions exchanging their publications for the ANNALS, and 40 foreign and 58 domestic institutions exchanging with the BULLETIN. In August about 900 reprints from the ANNALS were sent to 250 botanists in this country and abroad in exchange for their papers.

The cash receipts during the year from the sale of ANNALS, BULLETINS, reprints, BOOKS OF VIEWS, etc., was $1,496.13.

New Accessions.—The following are some of the noteworthy accessions received by the library during the year: Abderhalden, Handbuch der biologischen Arbeitsmethoden, pts. 423–436; Arnold Arboretum Contributions 1, 2, 3; Arthur, Manual of the rusts in United States and Canada; Atanasoff, Virus diseases of plants—a bibliography; Baker, The theory and practice of silviculture; Bartholomew, Handbook of the American Uredinales, 2nd edition; Bean, Trees and shrubs hardy in the British Isles; Bluhende Kakteen und andere Sukkulente Pflanzen, vol. 19; Buller, Researches on fungi, vol. 5; Durand and Pittier, Primitiae florae Costaricensis, vol. 1, pt. 3, vol. 2, pt. 7, vol. 3, pt. 1; Engler, Das Pflanzenreich, vol. 98g and 98h; Engler & Prantl, Die natürlichen Pflanzenfamilien, vol. 16c; Ergebnisse der Enzymforschung, vol. 3; Encyclopedie Mycologique, vols. 3–6; Flowering plants of South Africa, vol. 14; Gilbert, Les livres du mycologue: Les Bolets;

Godfery, Monograph and Iconograph of British Orchidaceae; Grove, A supplement to Elwes' "Monograph of the Genus Lilium," pt. 1; Green, Trees of North America, vol. 1, pt. 2; Gunther, The Greek herbal of Dioscorides—English edition by John Goodyer; Hardy and half-hardy plants, vol. 1; Harris, Physico-chemical properties of plant sap in relation to phytogeography; Hueck, Die Pflanzenwelt der deutschen Heimat, pts. 78–83; Hutchinson, The families of flowering plants, vol. 2; Index Kewensis, Suppl. 8; Javorka, Iconographia Florae Hungaricae, vol. 18; Kofoid, Termites and termite control; Konrad et Maublanc, Icones selectae fungorum, vol. 8; Lehmann-Neumann, Atlas and textbook of bacteriology; Lemée, Dictionnaire descriptif et synonymique des genres plantes phanerogames, vol. 5; Catalogue of the works of Linnaeus preserved in libraries of the British Museum; Loew, Die Flora der Juden, vol. 4; Nierenstein, Natural organic tannins; Rabenhorst's Kryptogamen-flora Deutschlands, Band IX. Abt. I[1], Lief. 1–4, Abt. IV[1], Lief. 1, 2, IV[2], Lief. 1, 2; Repertorium specierum regni vegetabilis, 39 missing volumes; Roth, Catalecta botanica, quibus plantae novae et minus cognitae describuntur; Stevens, Garden flowers in color; Silveus, Texas grasses; Société Linnéenne de Normandie, Bulletin, ser. I, vols. 1, 2, 10, series 2, vols. 1–6; Sorauer, Handbuch der Pflanzen-Krankheiten, 6th revised edition, Bd. I, Teils 1–2; Stanford, Economic plants; Thome-Migula, Flora von Deutschland, Oesterreich, und der Schweiz, Lief. 311–313; Vajda, Flora phytographica Hungariae, vol. 2, nos. 9–10; White and Sloane, The Stapelieae; Wright, The story of gardening; Zahlbruchner, Catalogus lichenum universalis, vol. 9, pts. 21–38; Zimmerman, Die Phylogenie der Pflanzen.

Statistical Information.—There have been donated to the library or received in exchange during the year 511 books valued at $1,297.00, and 1,388 pamphlets valued at $227.07. Three hundred and eighty-seven books were bought at a cost of $2,808.30, and 74 pamphlets at a cost of $134.88. The library now contains 49,451 books and 75,708 pamphlets. There are 332 manuscripts valued at $1,621.80, and 1,014,452 index cards valued at $12,353.13. A total of 7,366 cards were added

during the year, of which 1,221 were written by Garden employes, and 6,145 were purchased at a cost of $132.51. Four hundred and sixty-seven books were bound.

GEORGE T. MOORE,
Director.

STATISTICAL INFORMATION FOR DECEMBER, 1934

GARDEN ATTENDANCE:

Total number of visitors	15,536

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	33
Total number of books and pamphlets donated	104

PLANT ACCESSIONS:

Total number of plants and seed packets donated	60

HERBARIUM ACCESSIONS:

By Purchase—	
Harper, R. M.—Plants of Alabama	56
By Gift—	
Arnold Arboretum by R. E. Woodson, Jr.—*Amsonia Palmeri* Gray from Arizona	1
Deam, Charles C. by R. E. Woodson, Jr.—Plants of Indiana	3
Ennis, Miss Beulah—*Artemisia caudata* Michx. from Long Island	1
Scully, Dr. Francis J.—Plants of Arkansas	115
By Exchange—	
Demaree, Delzie—Plants of Ohio	312
Gray Herbarium, Harvard University—Photographs of types and authentic specimens of Bromeliaceae	200
University of Michigan by F. J. Hermann—Plants of Michigan, Indiana, etc.	104
Total	792

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

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OF THE MISSOURI BOTANICAL GARDEN

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MISSOURI BOTANICAL GARDEN BULLETIN

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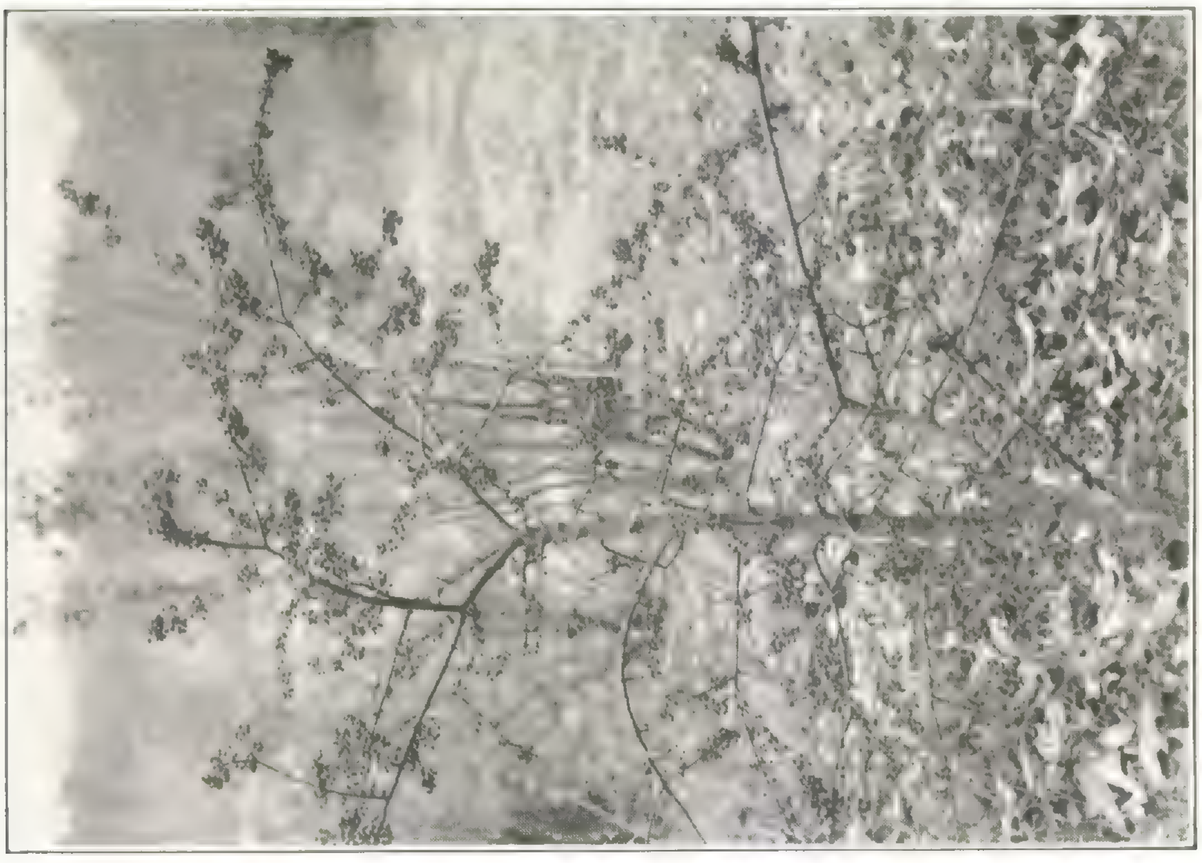


RHAMNUS UTILIS

Missouri Botanical Garden Bulletin

Vol. XXIII FEBRUARY, 1935 No. 2

NEW OR NOTEWORTHY PLANTS FOR ST. LOUIS. VII

BUCKTHORNS

A group of small trees which are free from insect pests and resistant to disease will prove of interest to every gardener. When these same trees demonstrate their hardiness and drought resistance by bearing a branch-breaking crop of berries during a summer such as 1934, then certainly they become impressive.

The buckthorns (Rhamnus) are such a group. Some of them have long been used as ornamentals, and we have become acquainted with the stained and bitter inner bark and the black fibrous roots. The roots are produced in a thick mat which seems capable of taking up all the available food and moisture. This seems to account for the buckthorns remaining alive during 1934, and is largely responsible for the ease with which they may be transplanted. They can be grown in almost any situation. They are shade-tolerant, but grow better in full sunlight. A deep moist soil is recommended, but as a cultivated subject they can be depended upon to grow splendidly in situations too dry and shady for other ornamental trees. Since the matted roots of these plants are found chiefly in the upper foot of soil, they do not compete with larger and deeper roots near-by and can be planted closer to trees than most other small trees and shrubs.

The buckthorns bear inconspicuous greenish flowers on lateral spurs and also from axillary buds on the current growth. Thus, the oldest wood is clothed with fruit provided sufficient sunlight reaches the fruiting spurs. The berries are usually black in color, though the native buckthorn (*R. caroliniana* Walt.) produces red berries which later darken. Birds are said to feed on the berries, but in the Garden most of the berries remain untouched all winter.

Of the new varieties, *Rhamnus Frangula* var. *latifolia* bears the largest crop of berries. In a sunny position it develops into a small tree 15 feet high and almost as broad. The growth habit is somewhat compact until maturity. Then the weight of the fruit causes the branches to bend down and outward, effecting the more open growth seen in mature specimens. The leaves are glossy and dark green, finely serrate, and in common with most other species of Rhamnus, almost but not quite opposite.

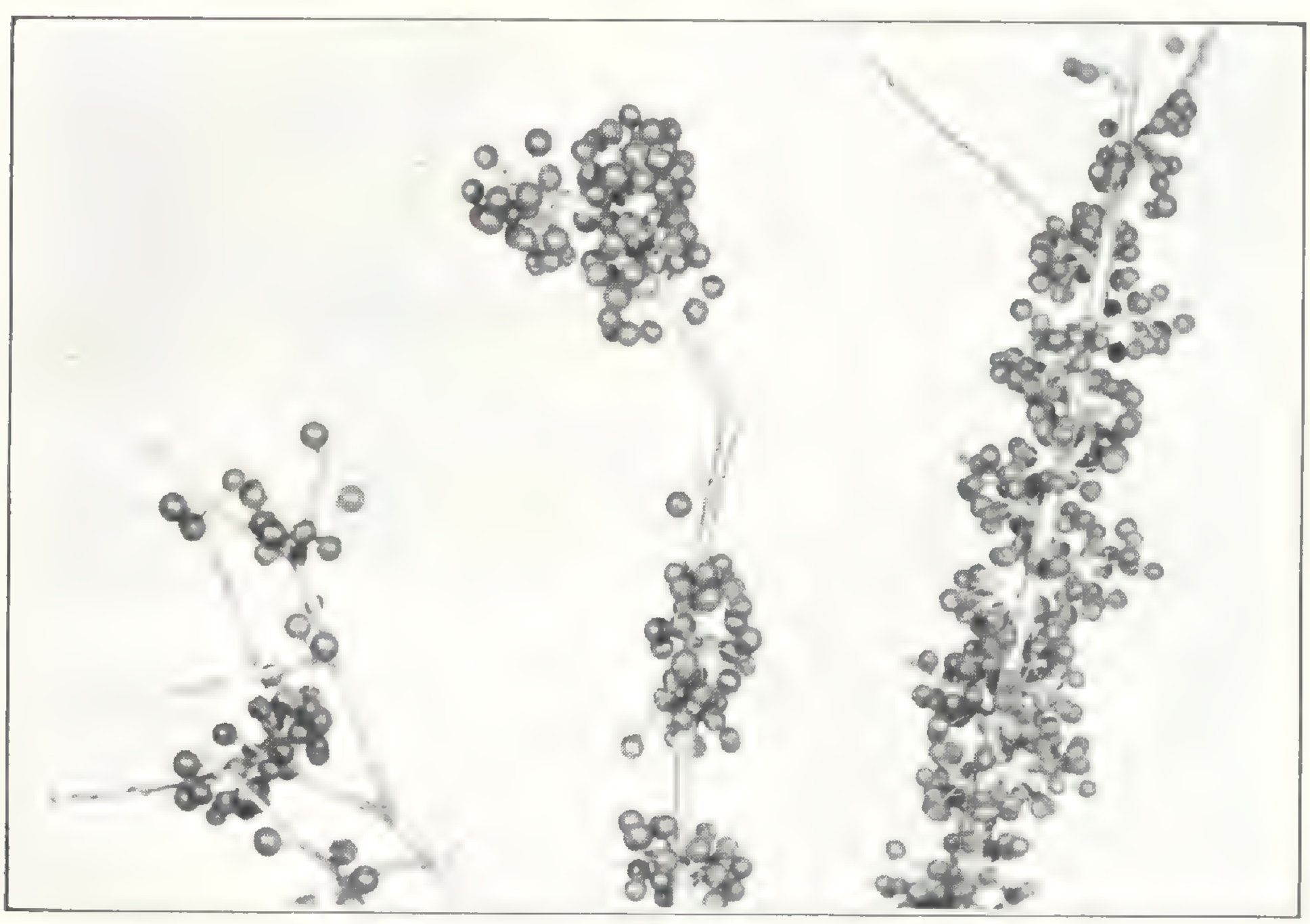
Rhamnus utilis also has the habit of bearing immense quantities of fruit. This species closely resembles the preceding but the fruit of *R. utilis* is slightly larger, and on account of its more robust branches it rarely loses its upright habit.

Rhamnus dahurica is much more conservative in the production of fruit than the other two species. It also has a greater tendency to spread and assumes a shrub-like appearance. The branches are more slender, and while the foliage is less leathery it is not burned by the summer sun. A. P. B.

THE PROPAGATION OF THE WHITE REDBUD

The redbud, *Cercis canadensis* L., is readily propagated from seeds. It should be planted in the autumn, the beds or frames being mulched to prevent lifting of the soil in winter. The seeds will germinate in early spring and produce plants 6 to 10 inches in height the first year. However, other means must be employed in order to obtain the white-flowered forms which do not come true from seeds. Both budding and grafting, with the seedlings of the common redbud as a stock, have

RHAMNUS FRANGULA VAR. LATIFOLIA



RHAMNUS DAHURICA, R. UTILIS, AND R. FRANGULA VAR. LATIFOLIA

BUDDING THE WHITE REDBUD

BUD DEVELOPMENT OF WHITE REDBUD

been tried. So far grafting has proved unsuccessful. The shoot produced from the graft, after consuming the nutriment stored in the scion, invariably withered and died. On the other hand, budding has been most successful, as the following partial record of experiments at the Arboretum shows.

One hundred shoots budded at various times during July, 1932, on one-year-old stock, resulted in sixty buds. Of these, fifty-five were left dormant until March, 1933, and the remaining 5 stock plants were cut just above the bud about a month after budding. The result on July 28, 1933, was fifty-five bushy plants 5–6 feet high, and five plants started in July, 1932, 2–3 feet high. This indicates that those left dormant until the following spring produced by far the best plants.

On July 1, 1933, 110 plants two years old were budded, of which fifty-seven grew on. On July 14 three of these were cut back just above the bud, and on July 28 they had grown eleven inches, as shown in pl. 8, fig. 2.

It is believed that the immersion of the buds in the following solution before being inserted greatly contributed to the success of the experiment. This formula is taken from "Nut Growing," by Robert T. Morris: 2.25 gms. $CaCl_2$, 1.25 gms. NaCl, 1.50 gms. KCl, 1 liter H_2O. L. P. J.

ECONOMIC USES OF PLANT SAP. II

RUBBER

When Columbus made his second voyage to the West Indies he found the natives of Haiti amusing themselves with balls made of an elastic substance which they obtained from the sap of certain trees. His report of the incident apparently created no frenzied speculation in Spain, for this strange material did not appear to any extent on the markets in Europe until about the middle of the eighteenth century. At that time it was used almost entirely to rub out pencil marks, hence the name "rubber." It was introduced into the United States about 1800, and a few years later the rubber industry had its

meager beginning in New England with the manufacture of erasers.

As the valuable properties of rubber became known, it was used to make various other articles such as overshoes and waterproof garments. However, these new commodities were not very satisfactory. The rubber had a tendency to harden and crack when exposed to cold temperature and to become soft or gummy when warm; it was subject to chemical decomposition and had inferior wearing qualities. Then in 1839 Charles Goodyear accidentally dropped a mixture of rubber and sulphur on a hot stove, thereby discovering the process of "vulcanization." The new product remained unchanged in ordinary temperatures, resisted chemical action, had excellent wearing properties, and was far more elastic. The discovery of vulcanization really marks the beginning of the rubber industry in the United States. Thousands of new uses were found for this product, and its commercial demand increased at an astonishing rate especially with the advent of the automobile. Now it ranks as one of the world's indispensable commodities, being used in the manufacture of tires, inner tubes, footwear, clothing, mechanical goods, druggists' supplies, surgical materials, rubber cements, tapes, elastic bands, hose, tubing, belts, electric insulation, carpets, erasers, toys, balls, and hard rubber articles, such as telephones, fountain pens, chemical trays, combs, buttons, etc. Large industries would be paralyzed if rubber should suddenly become unavailable. Fortunately, the supply has kept pace with the demand, which requires more than 900,000 tons of crude rubber annually.

The history of the exploitation of rubber reveals an interesting story beginning in the jungles of Brazil and extending to the tropics of the Far East and Africa. The pioneers in this development invaded and conquered the jungle to establish large rubber plantations. The Royal Botanic Gardens at Kew, England, were largely responsible for the plantations in the Far East. In spite of a rigid embargo Henry A. Wickham, an English botanist, managed to sail from Brazil, the native home of *Hevea brasiliensis*, or Para rubber tree, with 70,000 choice Hevea seeds. These seeds were carefully tended at the

Kew Gardens, and the seedlings were transferred to Ceylon, Malay, and India, to become the parent stock of the vast plantings which were to follow.

About 98 per cent of all crude rubber used is from plantations, the balance being wild rubber from the Amazon and Africa. Up to 1914 Brazil was the principal source of Para rubber, but since that year the center of production has shifted to British Malay, Dutch East Indies, Sumatra, Java, Madura, Ceylon, French Indo-China, Sarawak, Siam, Borneo, India, and Burma. Plantations have also recently been established in Liberia. The United States consumes about one-half of all the crude rubber produced.

Rubber, or caoutchouc as it is called in the trade, is obtained from the milky sap or latex of tropical trees, shrubs, and vines. With the aid of a microscope small globules of rubber may be seen floating in this sap which rapidly coagulates and forms a gummy substance when exposed to the air. Such a reaction is valuable to the plant for covering wounds to prevent the entrance of fungi. The latex from mature trees contains about 30 per cent rubber.

There are various grades of crude rubber depending on the source and relative purity of the product.

1. Para rubber is the best grade on the market and is practically the only type of crude rubber now used. It is obtained from several species of Hevea, but the large plantations now use *H. brasiliensis*, the Para rubber tree of Brazil, almost exclusively.
2. Caucho rubber is derived from *Castilloa elastica*, the native rubber tree of Central America and Cuba.
3. Guayule rubber comes from *Parthenium argentatum*, a shrub of Mexico.
4. African rubber is produced by *Funtumia elastica*, the rubber tree of Africa. Some climbing vines of Africa also yield latex, especially several species of Landolphia.
5. India rubber is obtained from *Ficus elastica*, the common ornamental rubber tree which is indigenous to Assam and Burma.
6. Jelutong rubber is produced by *Dyera costulata*, a tree found in the East Indies.

7. Ceara rubber is derived from *Manihot Glaziovii*, a tree native to Brazil.
8. Mangabeira rubber is obtained from *Hancornia speciosa*, a native tree of Brazil.
9. Balata rubber comes from *Mimusops globosa*, a tree which grows in the West Indies and the Guianas.

Many plants native to the United States, such as the milkweed, dogbane, and goldenrod, contain rubber but in such small quantities that their potential commercial values are still a matter of speculation.

All trees of *Hevea brasiliensis* do not yield the same quantities of latex. The average tree will yield about 5 pounds of rubber each year, but the yield of certain trees may be as much as 30 pounds a year. It was eventually discovered that production could be greatly increased by vegetative propagation of high-producing trees, and bud-grafting methods were developed to replace the seed method of propagation.

Rich soil, abundant moisture, and a minimum temperature of 73° F. are essential factors in the successful culture of rubber trees. Such conditions are found only in tropical regions. On the plantations the trees are planted in rows as in a fruit orchard, with about 90 trees to the acre. *Hevea brasiliensis* grows to a height of 60 to 80 feet, with a trunk diameter of 12 to 30 inches or more. The latex vessels which contain the rubber are located immediately beneath the outer surface of the bark, next to the cambium or growing layer of the tree.

Tapping is a delicate operation but may be accomplished without serious injury to the tree if done properly. A thin shaving of bark is removed, exposing the freshly severed ends of the latex tubes from which the milky sap flows. The cuts are made in a V-shaped or spiral panel which covers one-fourth to one-half the circumference of the trunk. The initial cut or tap of a panel is usually 2 to 4 feet from the ground, and subsequent shavings are removed at definite intervals from the lower edge of the previous cut. The panel is used up at the rate of one-half to one inch of bark per month, and the tapping may continue to the ground or another panel made every 6 to 12 months, depending on the prevailing system. On some

estates the trees are tapped every day for 4 to 6 weeks or longer, and then are given similar periods of rest. Another system is to tap the trees every alternate day. *Hevea brasiliensis* can be tapped frequently, but other rubber-producing plants cannot be tapped more than three or four times a year, thus interfering with stability of labor. This factor is largely responsible for the popularity of *H. brasiliensis* on rubber plantations. After being cut, the bark is gradually replaced by the cambium layer, and it is eventually possible to tap the regenerated bark.

The tapping operations commence at dawn, since the flow of latex is greatest in the early morning. When the cut is made a small cup is hung on the trunk in such a position that it catches all the milky sap which flows out. Three to four hours later, when the run of sap has stopped, the latex is collected in a pail and taken to the factory as quickly as possible to avoid premature coagulation. In some cases it is necessary to add an anti-coagulant such as sodium sulphite, formalin, or ammonia. The film of dried latex which remains on the cut is collected and sold as "tree scrap," an inferior grade of rubber.

At the factory the latex is diluted with water and strained to remove impurities. The two most important kinds of rubber made are sheet and crepe. To make sheet rubber, the latex is coagulated with formic or acetic acid and the coagulum passed through rolling machines until the rubber is about one-eighth inch thick. The sheets are then hung up to dry in a shed and exposed for about two weeks to the antiseptic action of smoke from a wood fire. To produce the pale-colored crepe rubber, it is necessary to add sodium bisulphite to the latex before it is coagulated with formic or acetic acid. Crepe rubber is rolled into thinner sheets and marked differently than sheet rubber. After rolling, it is hung up in a shed and air-dried for 10 to 12 days. Crepe rubber is used extensively as soles for footwear. To obtain the required thickness, several sheets of the thin crepe are laminated between rollers.

In some rubber districts primitive methods of handling the latex are still in use. The natives have long wooden paddles which they dip in the milky sap and rotate over a fire built of sticks and palm nuts. When the rubber hardens on the paddle,

it is again immersed in the latex and held over the smoky fire. This process is repeated until a large ball or "biscuit" is formed on the end of the paddle. Lumps of crude Para rubber prepared in this fashion are considered as first-grade material on the market, regardless of impurities. With the development of the modern plantation technique, the native methods have been practically abandoned.

The final stages in the manufacture of rubber include a thorough washing of the crude rubber to remove all impurities and then almost completely changing its physical properties by vulcanization. Practically all rubber is vulcanized except that used for liquid cements, electric insulating tape, adhesive tape, and crepe soles for footwear. Sulphur is the common vulcanizing agent, soft rubber containing about 3 to 5 per cent of this substance, while hard rubber may contain as much as 50 per cent. Many other materials, such as fibres, oils, waxes, powders, wood, metals, and glass, are now combined with rubber to obtain products with special properties.

Naturally, science has tried to wrest from the plant the mysteries of the generation of rubber. During the World War an effort was made to manufacture artificial rubber, but the expense involved was prohibitive. A synthetic rubber has been developed but at the present time it is impossible to predict its future status in the rubber industry.

GUTTA-PERCHA

Gutta-percha is a plant product somewhat similar to rubber. It is obtained from the latex of several species of trees but principally from *Palaquium Gutta*, the Taban tree, which was the original source, and *P. oblongifolia*, both found in the Malay Archipelago. Gutta-percha possesses great electrical resistance and is especially valuable for insulating underground and marine cables and other conduits where rubber, metals, or alloys would not be satisfactory.

The trees may be raised from seed or cuttings and mature in about 30 years, when they are 100 feet tall and have a trunk diameter of 2 to 3 feet. The latex vessels are located in the bark and the trees are tapped like rubber trees. Due to the

fact that the milky sap oozed from the cuts so slowly, the natives usually felled the tree and removed large strips of bark to hasten the process. Such drastic measures have been gradually replaced by more conservative tapping methods. A mature tree will yield about 2 to 3 pounds of gutta-percha in one year. The latex is boiled in open kettles over a wood fire. The impurities are removed and the coagulated mass pressed into blocks or cakes. These dull grayish-red colored cakes are shipped to market and are used in the manufacture of many valuable products.

CHICLE

The latex of *Achras Sapota,* a tropical American tree, provides chicle, the elastic ingredient of chewing-gum. Zigzag cuts are made in the bark from the base of the trunk up to 30 feet or more. The sap flows out slowly for about two hours and is collected at the base of the tree. The trees are usually rested for several years between tappings. The latex is boiled in open kettles and the coagulated gum moulded into cakes, which are packed and sent to market. To make chewing-gum, the chicle is remelted, washed, sweetened, and mixed with various flavoring materials. After rolling into thin sheets, it is put up in small packages, and appears on the market as chewing-gum. Several million pounds of chicle are shipped to the United States each year, and the value of the finished product amounts to many millions of dollars. D. C. F.

NOTES

Mr. G. H. Pring, Superintendent of the Garden, spoke before the Flynn Park School Parent-Teachers' Association, February 5, on "City Gardens."

Mr. L. P. Jensen, Manager of the Arboretum at Gray Summit, gave an illustrated talk before the members of the Garden Club of Gray Summit, January 7, on "The Use of Native Materials for Ornamental Planting."

A party of about sixty members of the science classes from the Eastern Illinois State Teachers' College, Charleston, Illinois,

visited the Garden, February 1. The advanced class of the group spent several hours in the library, herbarium, and experimental greenhouse, under the guidance of Dr. David C. Fairburn, Research Assistant to the Garden.

Dr. Hermann von Schrenk, Pathologist to the Garden, spoke at New York, January 22, before the Northeastern Lumber Dealers' Association, on "Termites," and before the American Wood Preservers' Association, on "Decay and Marine Borer Resistance of Creosoted Piles and Timbers in Tidewater."

Dr. Carroll W. Dodge, Mycologist to the Garden, and Dr. Julian A. Steyermark, formerly Rufus J. Lackland Research Fellow at the Garden, have returned from an eight-weeks' collecting trip in Panama. About 1,800 species, and over 5,000 specimens of plants were collected. The third member of the party, Mr. Paul Allen, a Garden apprentice, will remain in Panama several weeks longer in order to accompany Mr. A. A. Hunter, Manager Missouri Botanical Garden Tropical Station, on a collecting trip to Cocle Province, working over the Continental Divide from Penonome to the Atlantic Slope.

Recent visitors to the Garden library and herbarium include Dr. Harry J. Fuller, Instructor in Botany, University of Illinois, Urbana; Dr. W. H. Emig, Professor of Botany, University of Pittsburgh; Dr. Francis Drouet, in charge of Herbarium, University of Missouri, Columbia; Dr. E. R. Spencer, Professor of Botany, McKendree College, Lebanon, Illinois; Mr. Donald P. Rogers, graduate student and research assistant in botany, University of Iowa, Iowa City; Dr. David D. Keck, Assistant in Experimental Taxonomy, Carnegie Institution of Washington Laboratory, Stanford University, California; Professor Ernest B. Babcock, Professor of Genetics, University of California, Berkeley; Mr. Robert Swan Sturtevant, Editor American Iris Society Bulletin; Prof. A. T. Erwin, Associate Professor of Horticulture, Iowa State College, Ames; Mr. L. G. McLean, of the U. S. Erosion Plant Studies, Stillwater, Oklahoma; Dr. H. W. Rickett, Associate Professor of Botany, University of Missouri, Columbia.

STATISTICAL INFORMATION FOR JANUARY, 1935

GARDEN ATTENDANCE:

Total number of visitors	7,294

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	68
Total number of books and pamphlets donated	64

PLANT ACCESSIONS:

Total number of plants and seed packets donated	637

HERBARIUM ACCESSIONS:

By Purchase—

Degener, Otto—Plants of Hawaii	78
Lundell, C. L.—Plants of British Honduras	60
Smithsonian Institution by E. P. Killip—Plants of Peru, collected by G. Klug	449
Verdoorn, Fr.—"Hepaticae selectae et criticae," series VIII, Nos. 351-400, inclusive	50
Verdoorn, Fr.—"Musci selecti et critici," series II, Nos. 51-100, inclusive	50
Williams, Louis—Plants of Wyoming and Colorado	171
Williams, Louis—Plants of Colorado, New Mexico, Utah, Washington, and California	285

By Gift—

Klug, G.—Plants of Peru	50
Ortega, I. G.—Plant of Mexico	1
Williams, Louis—Plants of Wyoming	11

By Exchange—

Brooklyn Botanic Garden by H. K. Svenson—Plants of eastern United States and Canada	122
Farlow Herbarium, Harvard University—"Reliquiae Farlowianae," Cent. VII, Nos. 601-700, inclusive	100
State University of Iowa by G. W. Martin—Fungi of Iowa, etc.	33
University of Missouri by Francis Drouet—Plants of Massachusetts and Missouri	155
Total	1,615

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

THE GARDEN, 2315 TOWER GROVE AVENUE, ST. LOUIS, MISSOURI

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XXIII MARCH, 1935 No. 3

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Missouri Botanical Garden Bulletin

Vol. XXIII MARCH, 1935 No. 3

GARDENING AS A HOBBY

Some time ago there came to Shaw's Garden a letter from a street-car conductor in England, who wrote: "I am a young man whose hobby is gardening and I was very interested in your wonderful discovery of the lost African lily, an account of which I saw in our local paper." After asking if it would be possible to secure one of these plants, he continued: "All the young men here seem to be mad about sports and horse racing and the more wonderful things of nature never appeal to them"; showing how sincere this young Englishman was in his love for plants.

While there is "a pleasure in being mad which only madmen know" and there are many kinds of hobbies which seem a mild form of insanity to all those who are interested in some *other* sort of madness, it will readily be admitted, at least by those who love gardening, that *their* particular interest in plants is more sane and far superior.

In the first place, it is cheap. Though even the tiniest of backyards be not available, a few tin cans filled with soil may bring to the flower lover the thrill that only comes from doing a thing because you want to, and not because you have to.

In the second place, you get something for your money. No one who pursues gardening because he loves it—who, when he prepares the soil says to himself: "When the roots begin to taste this earth they'll be mighty glad they came to my gar-

den''—but gets more out of his hobby than he puts into it. All the exercise and fresh air that comes with outdoor sport, the adventure of the Arctic explorer, the thrill of the big game hunter, the joy of discovery of the collector, may be combined in raising from seed some little-known plant that has not previously been cultivated. With what pride a dirt gardener displays his conquests; how and where he got the seed; his failures; what he finally did that brought success—a tale he never tires of telling to those who must or care to listen—just like any other hobby rider.

No hobby *need* be useful, but it makes it none the less attractive should it happen to combine pleasure and profit. A beautiful woman who is also an excellent cook is a wonderful combination, and there is no reflection on either beauty or cooking. So with gardening. You are sure to get beauty, in leaf, or stem, or flower, or fruit. And if the leaf, or stem, or flower, or fruit happens to be good to eat, all the more reason for pursuing your hobby.

Then just think how tastes of every sort are appealed to, through the growing of plants. Some are interested in the kind of flowers you love to touch; other in masses of plants which at a distance are attractive, but close up look like the kind of bouquet one would send to a horse's funeral. Some are cranks about tulips or lilies; others strive for the newest kind of sweet corn, the largest tomato, the most delicious apple. And the competition at the flower shows—as keen as any golf match ever played!

The hobby of gardening is by no means confined to the growing months. What other recreation can equal the satisfaction that comes during the winter to the gardener as he sketches the outline of his next spring's adventure? The receipt and reading of the seed catalogues alone are even more fascinating than the latest mystery story, or any other class of fiction. Nor need the time before the winter fire be spent entirely in planning and dreaming of what the next season may have in store. Think of the myriad gardening books, treating of everything from fertilizer to flower, from pest to profit (and loss), from design to dinner table! Nor need one stop here. The garden-

ing hobby may be expanded to include some knowledge of what goes on inside the plant, as well as in the soil; how and why it works; the mystery of crossing two varieties to produce a new one; the fact that some plants have roots fifty to a hundred feet long, traveling that far for a drink—of water; why grass is green instead of red. Things like this help make life worth while and add zest to the ordinary humdrum of existence. And after all that's what a hobby is for.

Gardening pursued simply for pleasure strengthens the body, improves the mind, enlarges the soul. What more can you ask of a hobby? G. T. M.

MOISTURE AND TEMPERATURE RELATIONS IN TREES

A drought of several years, which reached a peak in July, 1934, presented unique opportunities for determining the moisture in tree trunks, and to a certain extent its relation to internal temperatures. Records of the St. Louis office of the Weather Bureau show the precipitation for the years 1932, 1933, and 1934 to be only slightly below normal; however, the distribution was far from normal. While it is not known how much the water storage in tree trunks departed from the normal, sufficient evidence exists to indicate that trees entered the winter of those years in a severely desiccated condition. In most cases the deficiency was not remedied previous to the opening of the buds the following spring, and it was reflected in the reduced annual increment and particularly in the comparatively short period during which the leaves were retained. Since there was abundant evidence that water shortage, which was cumulative, materially reduced growth, complete collapse was to be expected at any time. However, while trees suffered some injury during 1932 and 1933, total defoliation and collapse did not occur until July, 1934.

Studies carried on during other seasons indicated what maximum temperature might be expected before wilting began. When the temperature appeared to have reached the critical

MOISTURE DETERMINATIONS FROM INCREMENT BORINGS

TREE	During Peak of Hot Weather			After Rain and Cooler Weather		
	DATE OF BORING	TIME	PER CENT WATER PRESENT	DATE OF BORING	PER CENT GAIN	PER CENT LOSS
Tilia americana	7/19/34	3:00 P.M.	51.2	8/9/34	2.8	
Acer saccharinum	7/19/34	3:00 P.M.	47.5	Not taken		
Acer saccharinum	7/19/34	3:00 P.M.	47.5	Not taken		
Aesculus Hippocastanum	7/19/34	3:30 P.M.	54.3	Not taken		
Aesculus Hippocastanum	7/19/34	3:30 P.M.	51.5	8/9/34		
Phellodendron amurense	7/19/34	3:30 P.M.	67.7	Not taken		2.5
Acer saccharinum	7/19/34	4:00 P.M.	54.2	Not taken		
Acer saccharinum	7/19/34	4:00 P.M.	37.9	Not taken		
Ginkgo biloba	7/20/34	11:00 A.M.	45.4	Not taken		
Fraxinus americana	7/20/34	11:00 A.M.	40.1	Not taken		
Quercus imbricaria	7/20/34	11:00 A.M.	71.4	Not taken		
Sassafras	7/20/34	11:30 A.M.	85.0	Not taken		
Liquidambar Styraciflua	7/20/34	11:30 A.M.	58.6	Not taken		
Liquidambar Styraciflua	7/22/34	1:00 P.M.	58.5	Not taken		
Ailanthus glandulosa	7/22/34	1:00 P.M.	50.2	Not taken		
Ulmus americana	7/22/34	1:00 P.M.	51.5	Not taken		
Ulmus americana	7/22/34	1:30 P.M.	41.9	8/8/34	1.0	
Sassafras	7/22/34	1:30 P.M.	88.7	8/8/34		33.2
Platanus occidentalis	7/22/34	2:00 P.M.	70.5	8/8/34	4.5	
Quercus bicolor	7/22/34	2:00 P.M.	55.4	8/8/34	1.9	
Quercus bicolor	7/22/34	2:00 P.M.	60.0	8/8/34	5.5	
Quercus lyrata	7/22/34	3:00 P.M.	65.2	8/8/34	3.8	
Platanus occidentalis	7/22/34	3:00 P.M.	77.0	8/8/34		5.0
Gleditschia triacanthos	7/22/34	3:00 P.M.	67.4	8/8/34		22.0

point, increment borings were taken to determine the water content of the trunk. The following table shows the moisture present in tree trunks as determined gravimetrically: All borings were taken from the north side at breast height. When used on even soft wood trees the increment borer became too hot to touch, and resulted in the loss of some moisture. Immediately upon withdrawal from the tree the core was wrapped in heavy lead foil and rushed to a laboratory for weighing.

From the above table it will be noted that a majority of the trees contained around 50 per cent moisture. Generally those containing more appeared in much better condition, although they may have lost some foliage. Those with less than 50 per cent moisture were, without exception, either entirely defoliated or bore only scorched and wilted leaves. Thus, it appears that 50 per cent moisture is necessary for trees under the conditions existing in the Middle West during the past several years. The slight moisture increase which followed lower temperatures and rain indicates that 50 per cent moisture is sufficient during periods of greater humidity and lower temperatures. Two trees, the locust and sassafras, lost large quantities of water during the last few days of the extremely dry weather. The locust had been defoliated for several weeks prior to July 19, but the sassafras lost no foliage during any part of the summer.

Unfortunately, temperature records could not be made of every tree from which increment borings were taken, due to the comparatively short interval between the sudden and general wilting, and the first substantial rain which was followed by lowered temperatures. Extremely high internal temperatures cannot occur except under high external temperatures, and since the 50 per cent moisture was sufficient for the tree during periods of lowered temperature, unless a temperature record could be made immediately it was of no significance. However, the following table indicates the close relationship between internal temperatures and external appearances. It is impossible to formulate an accurate table of appearances, and it will be found that the moisture present in two trees of like condition might vary as much as five per cent.

AMERICAN ELM

(Ulmus americana)

Tree No. 1	34.5° C.	Beginning to wilt
Tree No. 2	34.0° C.	Beginning to wilt
Tree No. 3	29.0° C.	Normal
Tree No. 4	30.0° C.	Very near normal
Tree No. 5	34.0° C.	Wilting
Tree No. 6	31.5° C.	Beginning to wilt
Tree No. 7	37.0° C.	Wilted
Tree No. 8	30.0° C.	Normal
Tree No. 9	29.5° C.	Normal
Tree No. 10	35.0° C.	Beginning to wilt
Tree No. 11	37.0° C.	Beginning to wilt
Tree No. 12	30.0° C.	Normal
Tree No. 13	32.0° C.	Normal
Tree No. 14	29.0° C.	Normal
Tree No. 15	35.0° C.	Slightly wilted
Tree No. 16	28.0° C.	Normal

The above trees formed a double row along each side of a road. They varied greatly in all respects except age and type of soil on which they grew. The notation of their condition was made prior to temperature readings, and the temperatures were taken from an immersion thermometer inserted one and one-half inches below the bark. The use of an immersion thermometer is open to criticism, but the results when checked against more critical work showed that for diagnostic purposes the method was satisfactory. It will be noted from the above table that 32° C. is the maximum recorded for any tree diagnosed as "normal." With an ample supply of water the internal temperature will remain well below this maximum, which is never attainded until the moisture supply approaches 50 per cent by weight. As the supply is further reduced temperatures increase and may attain 46.5° C. for a scorched and wilted tree.

A. P. B.

BOOKS ON NATURAL HISTORY IN EARLY ST. LOUIS

The following paper on early natural history libraries in St. Louis was contributed by Mr. John Francis McDermott, of the department of English of Washington University:

In January, 1858, Henry Shaw, writing to Dr. Engelmann in Europe, enclosed a list of thirty-four works, the first large purchase for the library of the Missouri Botanical Garden. This notation represented the beginning of one of the largest and finest libraries of its kind in the world, but not the beginning of an interest in botany in St. Louis. Some study and knowledge of plant life had been an established thing long before Mr. Shaw came to America, long before the many amateur or professional botanists or naturalists started working from St. Louis. Before Dr. Saugrain there was no one, I think, who considered himself a botanist, and Saugrain had too many concerns in his life to devote himself to botany, but from the very beginning of history in St. Louis we find individuals who are conscious of scientific knowledge. The evidence is in the books owned by the Creoles; their libraries, though small, contained an interesting variety of books concerned with natural history.[1]

The LaClède Papers in the Missouri Historical Society contain a full record of what was the first important private library in St. Louis. For this, and for all libraries mentioned, with the exception of Saugrain's, the book record is drawn from the inventory of the estate, made after the decease of owner, or from record of sale. The data are generally disappointing; most often only a brief (and possibly inaccurate) title is given, with number of volumes, and in some instances with a fragment of the name of the author. In my lists, I give the item just as I find it described and suggest the identification possible in light of the meager evidence.

At the time of Pierre LaClède's death, 1778, fourteen years after he founded St. Louis, he owned more than two hundred volumes. As a man settling in a new country, it was perhaps

[1] The complete extant data I am presenting elsewhere in a study of the Creole libraries in early St. Louis.

as much a matter of necessity as of interest that LaClède know something of trees and plants; the items in his library certainly seem to be of general value rather than of scientific. Yet it is interesting to know that he possessed not fewer than twenty volumes concerned in some way with natural history. (Perhaps, too, it is interesting to see what passed for works on natural history in the late eighteenth century.) These items, valued at 210 livres and sold to five St. Louisans for 141 livres 15 sols, were:

La Culture des Terres. 3 volumes.—Possibly an edition of Henri Duhamel de Monceau (1700–1781, pensionnaire-botaniste of the Académie des Sciences, Paris, and member of various other scientific societies): *Traité de la culture des terres suivant les principes de M. Tull.* Paris, 1753–61, 6 vol. in –12. This item was valued at 15 livres and sold to A. Chouteau for 4 l.

Avis pour le Transport. 1 volume.—This seems, without question to be Duhamel de Monceau's: *Avis pour le transport par mer des arbres, des plantes rares, des plantes vivaces, des sémences, et de diverses autres curiosités d'histoire naturelle.* Paris, 1752, 1753, 1 vol. in –12: valued at 10 livres and sold to F. Vigo for 2 l. 5 s.

Le Jardin Potager. 2 volumes.—On this subject I find a number of works. LaClède's item might have been Garnier: *Nouveau traité de la culture des jardins potagers* . . . Paris, 1692, 8°; or Louis Liger: *La culture parfaite des jardins-fruitiers et potagers, avec un traité facile pour apprendre a elever des figuiers.* Paris, Beugnié, 1703, 2 vol. in –12. Valued at 10 l.; sold to L. Perrault for 10 l.

La Maison Rustique. 2 volumes.—*La maison rustique, ou économie générale des biens de la campagne.* There were many editions of this work in the 18th and early 19th centuries, issued under variant titles. The first edition was published in 1700, Paris, 2 vol. in –4; the 8th in 1762; the 9th in 1768. Louis Liger (1658–1717, agronomist) is given credit for most of the early editions. There were a number of copies of this work (various editions) in the Creole libraries of early St. Louis. See issue described below in Saugrain list. This item, valued at 40 l., sold to L. Dubreuil for 30 l.

Méthode pour la Culture des Arbres a Fruit. 1 volume.—Probably *Méthode pour bien cultiver les arbres à fruit, et pour elever les treilles, par les Sieurs de la Rivière et Dumoulin.* Paris, Didot, 1738, in –12. Valued at 5 l.

Le Spectacle de la Nature, par M. Pluche. 8 volumes.—L'abbé Noël-Antoine Pluche (1688–1761): *Le spectacle de la nature, ou entretiens sur l'histoire naturelle et les sciences.* La Haye, 1743, 8 vol. in –12. A very popular work reprinted many times in the 18th century. There were a number of copies (various editions) in St. Louis. Valued at 40 l.; sold to J. B. Cambas for 50 l.

Le Dictionnaire de Commerce. 3 volumes.—I include this title, because I think it most probably the *Dictionnaire universelle de*

commerce, d'histoire naturelle, d'arts et métiers, of Jacques Savary Desbrulons (1677–1716). First edition, Paris, Estienne, 1723, 2 vol. *Supplement,* ou Tom. III, Paris, fr. Estiennes, 1730, 1 vol.; en tout, 3 vol. in –fol. Numerous editions. Valued at 90 l.; sold to Cambas for 40 l. 10 s.

In 1799 Pierre Joseph Didier, Benedictine and Curé of the parish, died. It was nine years since he had left Paris to come to the ill-fated Gallipolis as Vicar-General, and five years since he had arrived at St. Louis. "It was told of him," says Father Garraghan, "that he had some knowledge of medicine, and would prescribe simple remedies mostly from herbs, which he raised in his own garden, one of the best of the early gardens laid out in St. Louis."[2] His knowledge of medicine and botany is indicated by the evidence of his library.[3] Of his more than 260 books (of which 76 remain unidentified) not fewer than 24 volumes were concerned with these two subjects. Those relating to botany were:

[?] de la Historia Natural de la Quimica. 7 volumes.—The first word of this title I cannot decipher. I think the item most probably is Antoine Francois de Fourcroy (1755–1809, member of most of the scientific societies of Europe): *Elements d'histoire naturelle et de chimie.*

Un Diccionario de Medicina. 6 volumes.—Probably James Miller (English physician of the 18th century): *Dictionnaire universel de médecine, de chirurgie, de chimie, de botanique, etc.,* translated from the English by Diderot, Eidous, and Toussaint. A revised and corrected edition by J. Busson, Paris, 1746 and following years, was published in 6 vol. in –fol.

Un Diccionario de Jardineros. 8 volumes.—Probably Philip Miller (died 1771): *Dictionnaire (et Calendrier) des Jardiniers, contenant les méthodes les plus sûres et les plus modernes pour cultiver et améliorer les jardins potager, à fruits, à fleurs et les pepinières, ainsi que pour reformer les anciens pratiques de l'agriculture, avec les moyens nouveaux de faire et de conserver le vin, suivant les procédés actuellement en usage parmi les vignerons les plus instruits de plusieurs pays de l'Europe, et dans lequel on donne des préceptes pour multiplier et faire prosperer tous les objets soumis à l'agriculture et la maniere d'employer toute sortes de bois de charpente,* ouvrage traduit de l'anglais sur la huitième édition, par une so-

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[2] Garraghan, Gilbert, J., S. J.: *Saint Ferdinand de Florissant.* p. 86. (Loyola Univ. Press. Chicago, 1923.)

[3] *French and Spanish Archives of St. Louis* (MSS. Missouri Historical Society) No. 2651. The inventory of Didier's estate is in Spanish and all titles are in Spanish, but since Didier was a Frenchman there is little doubt that the books were all French—or Latin.

ciété de gens de lettres (par M. Laur.-Marie de Chazelles et autres) avec des notes (par Hollandre). Paris, Guillot, 1785–88, 8 vol. in –4. (Quérard: *La France Littéraire*, 6: 131–132, adds a note: "Linné disait que ce livre serait le dictionnaire des botanistes plutôt que celui des jardiniers.")

Among other libraries of early St. Louis I find further, though slighter, evidence of interest in botany. Included in the books of Antoine Hubert (died 1778) is a copy of Pluche: Le Spectacle de la Nature, 7 volumes. This was bought by M. le Commandant (Fernando de Leyba) for 18 livres. The community estate of Gabriel Cerré and his deceased wife was partitioned in 1802. At that time they possessed[4]: (Pluche): Le Spectacle de la Nature, 5 volumes, and Instructions des Jardiniers, 2 volumes. The second of these titles I have not identified, but most 18th century works of such title contained some botanical information. It was valued at 4 piastres.

Charles Gratiot, a resident of St. Louis for nearly forty years, who died in 1817, left a copy of La Maison Rustique, 2 volumes.[5] Ceran de St. Vrain, brother of the last Spanish commandant, and himself a resident of Upper Louisiana from 1796 (died 1818), had La Maison Rustique, 1 volume, valued at two dollars, and Manuel Botanique, 1 volume, valued at fifty cents.[5] The latter is possibly *Manuel de botanique contenant la propriété des plantes qu'on trouve à la campagne aux environs de* Paris, par. M.D. (Ant.-Nic. Duchesne, fils). Paris, 1764, in –12.

Louis LaBeaume (died 1821) also possessed La Maison Rustique, 2 volumes, and Labe Rosier, 9 volumes.[5] The latter is obviously the name of the author, and I suggest that this may be the Abbé Francois Rozier: *Observations sur la physique, sur l'histoire naturelle, et sur les arts, ou journal de physique*, Paris, 1771–1772, 18 parts in 9 vols. in –12.

In the records of the early libraries there are listed at least 500 volumes which are not identified. Among these there may have been some works touching on natural history. For instance, Dr. Auguste Condé (who died in 1776) left 72 volumes

[4] Missouri Historical Society: *City Hall Records: Estate Mad. Cerré 1802*, bd. mss.

[5] *Records of the Probate Court St. Louis.*

"tant de chirurgie que autres," and Claude Mercier (died 1787), another physician and surgeon, left thirty-seven unidentified volumes.[6]

The largest library of its day in St. Louis was that of Auguste Chouteau, who assisted LaClède in the founding of the place. At his death in 1829 he left more than 600 volumes, but that his library was of early foundation is indicated by the record of his purchases as early as the LaClède sale, and by the observation of Brackenridge, who found it in 1810 one of the largest private libraries he had yet seen. Among Chouteau's books the following titles have some connection with botany:

Dictionnaire du Cultivateur. 2 volumes.—Probably P.-A. Alletz (1703–1785): *L'Agronome, dictionnaire portatif du cultivateur,* Paris, V°, Didot, 1760, 2 vol. in –8.

Histoire Naturelle de Buffon. 6 volumes.—I am unable to find reference to an edition in 6 vol., but the identity of the work is clear enough.

Culture des Terres. 3 volumes.—Chouteau bought this at the LaClède sale, 1778, and paid 4 livres for it.

Histoire des Plantes. 2 volumes.—Probably Nicolas Deville: *Histoire des plantes de l'Europe et des plus usitées qui viennent d'Asie, d'Afrique et d'Amérique, où l'on fait leurs figures, leurs noms, en quel temps elles fleurissent et le lieu ou elles croissent, avec un abrégé de leurs qualités et de leurs vertus specifiques, et rangée suivant l'ordre de Pinax de Gaspard Bauhin.* Lyon, Duplain, 1737. 2 vol. in –12.

Dictionnaire des Sciences. 35 volumes in fol.—Probably Denis Diderot (1713–1784): *Encyclopédie, ou dictionnaire raisonné des sciences, des arts et des métiers,* par une Société de gens de lettres, mis en ordre et publié par M. Diderot. . . Paris, Briasson, 1751–80, 35 vol. in –fol.

Le Jardinier Solitaire. 1 volume.—Possibly *Le jardinier solitaire, ou dialogues contenant la méthode de cultiver un jardin fruitier et potager* (par Gentil). Paris, Rigaud, 1705, in –12. Reprinted numerous times in the 18th century.

Spectacle de la Nature. 9 volumes, 8 vol., 3 vol.—Pluche again. Chouteau had three sets, or partial sets.

Dictionnaire de Commerce. 3 volumes.—Identity suggested in list of LaClède's books.

The climax of this early interest in natural history we reach in the person of Dr. Antoine Francois Saugrain, physician, mineralogist, and botanist. He left Paris, and France, for the

[6] Fr. and Span. Archives St. Louis.

last time in 1790, expecting to settle in Gallipolis. He came to St. Louis in 1799, the first scientist of whom we have any knowledge as a resident of the town. At his death in 1820 he left a library of 450 volumes, many of which were scientific in nature. Dr. Saugrain's library is still in existence intact, in possession of Mr. Morrison Pettus and Miss Mary Elise Pettus, great grandchildren of Saugrain. I am greatly indebted to Mr. Pettus and Miss Pettus for permission to make a catalogue of the Saugrain books for my forthcoming study of the French libraries in early St. Louis; it is part of that material which I am presenting here. The information for each item is taken directly from title-page. Among those books were:

Barrelier, Jacques: *Plantae per Galliam, Hispaniam et Italiam observatae, iconibus aeneis exhibitae.* Parisiis, Stephanum Ganeau, MDCCXIV, in –fol.

Buffon, G. L. de: *Le Buffon de la Jeunesse, ou Abrégé d'Histoire Naturelle;* ouvrage élémentaire . . . rédigé par Pierre Blanchard, 4e edition, corrigée et augmentée. Paris, Le Prieur, 1809, 5 vol.

Chomel, P. J. B.: *Abrégé de l'Histoire des Plantes Usuelles, dans lequel on donne leurs noms differents, tant Francois que Latins, La manière de s'en servir, la dose, & les principales compositions de pharmacie, dans lesquelles sont employées.* Cinquième édition, revue et corrigée, Paris, Jacques Clouzier, MDCCXXXIX, 2 vol.

Chomel, P. J. B.: *Supplément à l'Abrégé des Plantes Usuelles . . .* (Tome troisième, of previous item).

Chomel, Noël: *Dictionnaire Economique: contenant l'Art de Faire Valoir les Terres, et de Mettre à Profit les Endroits les plus steriles; l'Etablissement, l'Entretien et le Produit des Pres, tant Naturels, qu'Artificiels; le Jardinage; la Culture des Vignes, des Arbres (forestiers & fruitiers), & des Arbustes; le Soin qu'exigent les Bêtes à Cornes et celles à Laine, les Chevaux, les Chiens, &c.; les Vêrs-a-soie, les Oiseaux. On y trouve un ample détail des profits et agremens qui procurent les Biens de Campagne. . . .* ouvrage composé originairement par M. Noël Chomel. . . nouvelle édition, en-

tièrement corrigée et très considérablement augmentée, par M. de La Marre; 3 vol. Paris, Ganeau, Bauche, les freres Estienne, D'Houry, MDCCLXVII.

————————: *Dictionnaire Botanique et Pharmaceutique, contenant les Principales Propriétés des Mineraux, des Végétaux, et des Animaux d'Usage: avec les Préparations de Pharmacie, internes et externes, les plus usitées en Médecine & en Chirurgie.* . . . Par***, Rouen, Pierre Machuel & Jean Racine, MDCCLXXXII.

————————: *Dictionnaire Universal, Historique, Critique, et Bibliographique.* . . ., neuvième édition, revue, corrigée et augmentée. . . Paris, Mâme frères, 1810, 18 vols. in –8; and Supplément 2 vol. in –8 (Tomes XIX and XX), Paris, Prudhomme fils, 1812.

Donn, James: *Hortus Cantabrigiensis, or a Catalogue of Plants, Indigenous and Exotic*, sixth edition, Cambridge, Metcalfe, 1811.

Fourcroy, A. F. de: *Eléments d'Histoire Naturelle et de Chimie*, 4° edition, Paris, Cuchet, MDCCXCI, 5 vols.

————————: *La Nouvelle Maison Rustique, ou l'Économie Rurale, Pratique et Génerale de tous les Biens de Campagne.* nouvelle édition, entièrement refondue, considérablement augmentée, et mise en ordre, d'après les experiences les plus sûres, les auteurs les plus estimés, les memoires et les procédés de cultivateurs, amateurs et artistes, chacun dans les parties qui les concernant; par J. F. Bastien; Paris, Deterville, MDCCCV, 3 vol. in –8.

Marshall, Charles: *An Introduction to the Knowledge and Practice of Gardening* . . . first American from the second London edition, considerably enlarged and improved. To which is added an Essay on Quick-Lime . . . by James Anderson; Boston, Joseph Nancrede, 1799.

Martin, Louis Aimé: *Lettres à Sophie sur la Physique, la Chimie, et l'Histoire Naturelle*, quatrième édition, corrigée et augmentée, Paris, Gide fils, 1814, 2 vol.

Rueneuve, Angrand de: *Observations sur l'Agriculture et le Jardinage, pour servir d'instructions à ceux qui desireront s'y rendre habiles.* Paris, Claude Prudhomme, MDCCXII, 2 vol.

Vaillant, Sebastien: *Botanicon Parisiense, ou Dénombrement par ordre alphabetique des plantes, qui se trouve dans les environs de Paris.* . . .

enrichi de plus de trois cents figures, dessinées par le Sieur Claude Aubriet. . . ., Leide & Amsterdam, Jean & Herman Verbeek, Balthazar Lakeman, MDCCXXVII, in –fol.

Valmont-Bomare: *Dictionnaire raisonné universel d'Histoire Naturelle, contenant l'Histoire des Animaux, des Végétaux et des Mineraux, et celle des Corps celestes, des Metéores, et des autres principaux Phénomenes de la Nature; avec l'Histoire des Trois Règnes, et le Détail des Usages de leurs Productions dans le Médecine, dans l'Économie domestique et champêtre, et dans les Arts et Métiers* . . . ., quatrième édition, revue et considérablement augmentée par l'auteur, Lyon, Bruyset freres, MDCCXCI, 15 vol.

In the early decades of its history, then, St. Louis showed a definite interest in botany, for in private libraries there were 32 works (in 41 copies, running to 187 volumes) which were concerned, in whole or in part, with natural history. For a people almost entirely mercantile such a showing is unusual.

NOTES

Dr. Ralph Voris, Head Department of Biology, Southwest Missouri State Teachers' College, Springfield, Mo., visited the Garden recently.

Mr. Paul A. Kohl, Floriculturist to the Garden, spoke before the St. Louis Horticultural Society, March 1, on "From Seed to Flower."

Mr. L. P. Jensen, Manager Missouri Botanical Garden Arboretum, has been appointed a member of the Franklin County Planning Board, and on March 5 he gave a talk before the Board at the Courthouse, Union, Mo., on "The Importance of Regional Planning."

Dr. George T. Moore, Director, and Mr. George H. Pring, Superintendent of the Garden, have just returned from a visit to the Garden's Tropical Station, at Balboa, Canal Zone. The

main purpose of this trip was a thorough inspection and checking of the collections of plants at the Tropical Station.

Dr. C. W. Dodge, Mycologist to the Garden, gave a talk before the Cathedral Luncheon Club at Christ's Church Cathedral, February 13, on "Botanical Research and Exploration in Panama," and on March 13 he spoke before the Academy of Science of St. Louis, on "Botanical Exploration in the Vicinity of Madden Lake, Canal Zone."

The first number of Volume XXII of the ANNALS OF THE MISSOURI BOTANICAL GARDEN has recently been issued, with the following contents: "Observations on the Inflorescence of Apocynaceae" by Robert E. Woodson, Jr.; "A New Kallstroemia from Texas" by Louis Williams; "A Critical Study of Certain Epappose Genera of the Heliantheae-Verbesininae of the Natural Family Compositae" by Ward M. Sharp.

STATISTICAL INFORMATION FOR FEBRUARY, 1935

GARDEN ATTENDANCE:

Total number of visitors	9,102

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	76
Total number of books and pamphlets donated	150

PLANT ACCESSIONS:

Total number of plants and seed packets donated	400

HERBARIUM ACCESSIONS:

By Purchase—	
Degener, Otto—Plants of Hawaii	137
Goehring, Mrs. Susie—Herbarium of the late Dr. G. H. Goehring	1056
Herter, G.—Plants of Uruguay	123
Lingnan University by Professor Franklin P. Metcalf—Plants of China	194
Lundell, C. L.—Plants of British Honduras	50
Yunker, T. G.—Plants of British Honduras	385
By Gift—	
Evans, A. W.—Lichens of the West Indies	5
Fisher, George L.—*Brongniartia minutifolia* Wats. from Texas	1

Gill, L. S.—Reproduced illustrations of Engelmann's drawings of *Arceuthobium*	8
Lundell, C. L.—Apocynaceae and Asclepiadaceae from Mexico and British Honduras	15
New York Botanical Garden—Lichens of the Fiji Islands	8
Peebles, R. H.—*Amsonia* sp. from Arizona	1
Reed, F. M.—Lichens of California	10
Steyermark, J. A.—*Grindelia stricta* DC. from California	2
Teodorowicz, Felix—*Thelephora* from Poland	1
By Exchange—	
Maguire, Basset—Plants of Utah	349
Division of Plant Industry, Botanical Section, Pretoria—Plants of South Africa	130
U. S. National Museum—Miscellaneous flowering plants	50
University of Minnesota—Plants of Utah, collected by J. Arthur Harris	600
By Field Work—	
Dodge, C. W.—Plants of Panama, collected by C. W. Dodge, J. A. Steyermark, and P. Allen in 1934–1935	6,775
By Transfer—	
Cutak, Ladislaus—*Rynchosia phaseoloides* DC. from horticulture	1
Total	9,901

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

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OF THE MISSOURI BOTANICAL GARDEN

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Missouri Botanical Garden Bulletin

Vol. XXIII APRIL, 1935 No. 4

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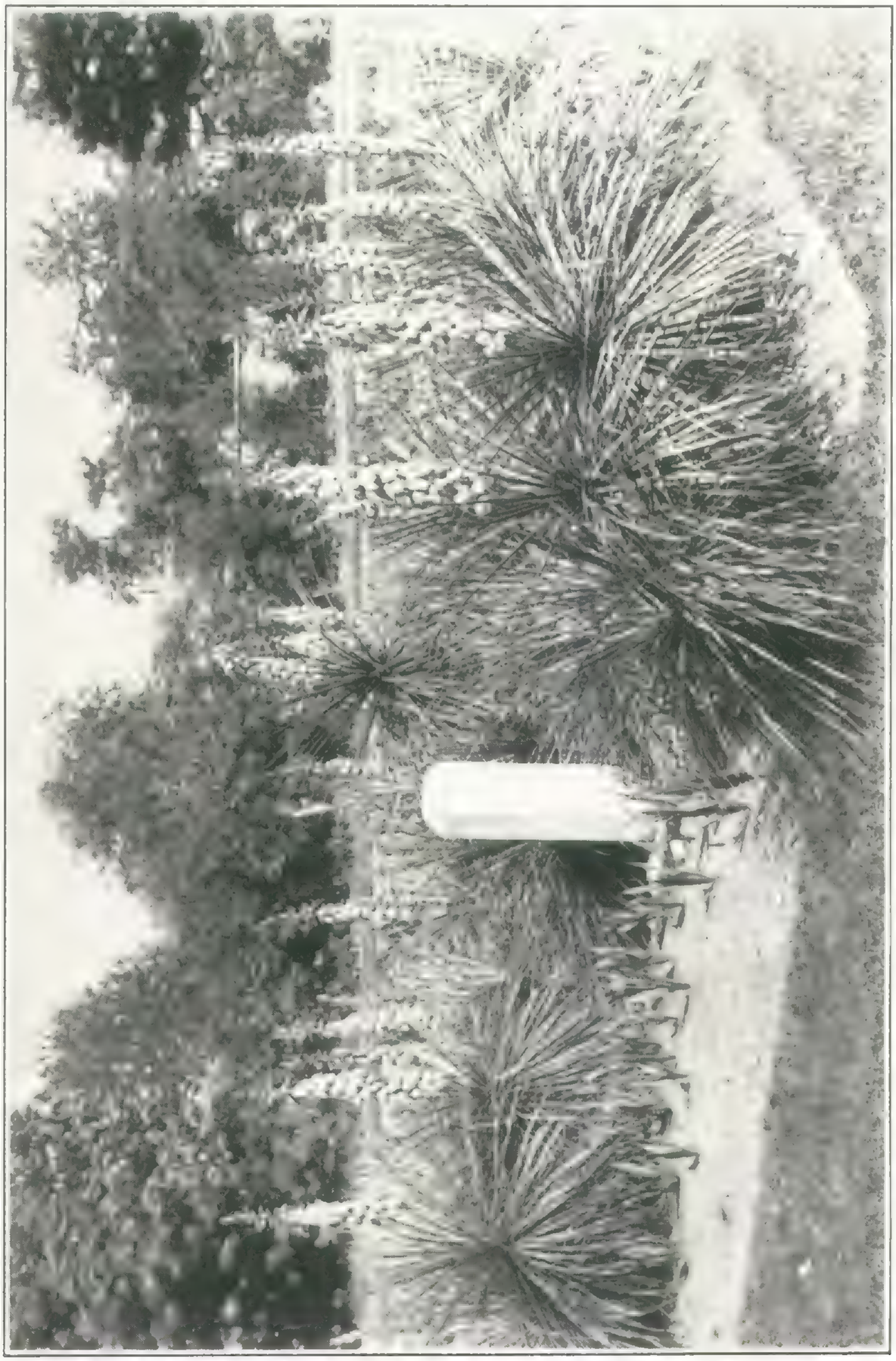

GROUP OF YUCCA GLAUCA (ANGUSTIFOLIA), MAY 26, 1911

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Vol. XXIII April, 1935 No. 4

AN OLD YUCCA BLOOMS AGAIN

Only one plant growing at the Missouri Botanical Garden at the present time has the distinction of having been "labeled" by Mr. Shaw. This is *Yucca glauca* Nutt. (*Y. angustifolia* Pursh), the sole surviving member of a group of yuccas which at one time flourished in this same location as shown in plate 9, this photograph having been made May 26, 1911. Up to a few years ago this solitary yucca was barely able to remain in an upright position on account of the long trunk lying on the surface of the ground. However, by digging a trench in which the stem was buried the plant has increased in vigor, and last May for the first time in many years it produced a flower spike (pl. 10, photographed May 25, 1934).

The somewhat weathered stone tablet, which gives the history of this yucca, reads as follows:

Y U C C A

angusti folia
planted 1860
by the lamented
Dr. Charles A. Pope
placed here
in memoriam
by H. S.

The close association of this plant and its marker for the last seventy-five years arouses one to speculate whether plant and

tablet will reach the century mark twenty-five years hence. No spot in the Garden is worn away so much as that directly in front of this tablet. The moment a visitor sees this white "monument," as the average person refers to it, his curiosity knows no bounds and it must be satisfied. However, it is a matter of conjecture how many of the curious are disappointed at not finding some person buried at the base of this stone.

Was Henry Shaw accustomed to placing such memorials? We believe not. Mr. Shaw apparently placed a tablet only to commemorate a gift or the visit of some notable person. Mr. James Gurney, Superintendent of Tower Grove Park where several more tablets of Shaw's time are to be found, has called attention to the following memorial trees as described in the book "Tower Grove Park," published in 1883:

THE DARBY TREES

In 1868, John F. Darby, a well-known citizen and lawyer of St. Louis, and Mayor of the city during the years 1835, '36 and '37, and also during the year 1840, presented to the park a small collection of trees from North Carolina. They are planted near the north drive in the eastern end of the park, and a plain marble slab stands at the spot bearing the inscription: "Trees from North Carolina, presented by John F. Darby, 1868." The trees are also mentioned by name:

Liriodendron—Tulip tree.
Liquid Amber—Gum tree.
Pinus Taeda.
Taxodium—Deciduous cypress.
Carpinus—American hornbeam.
Tilia—American linden.
Ilex—American holly.

These trees are not especially representative of North Carolina, but were brought from that State and planted together in memory of the donor, a distinguished citizen much interested in the success of the park.

THE NEILSON MULBERRY

One windy afternoon in March, 1880, Adelaide Neilson went with friends to Tower Grove Park to see the Shakespeare bronze, descriptions of which had awakened her interest. To one of the friends she had written from a distant city:

"A little strolling player will soon visit dear St. Louis, alas! for the last time!! Thinking of it I weep tears of sorrow!"

As she had resolved to retire from her profession and live at home, in England, she felt it her duty to see the Tower Grove

YUCCA GLAUCA (ANGUSTIFOLIA) AND ITS MARKER, PHOTOGRAPHED MAY 25, 1934.

statues. Neilson was in her happiest mood, and yet she seemed to chat and laugh under a shadow. She had frequent warnings. The doctors had told her to quit work or expect a sudden summons hence. She would quit work, she said, but the sudden summons would come. She was sure of that, and the certainty gave her life a keener zest.

The drive in the park was exhilarating, and she was brilliant as nature's budding green. The Humboldt was soon passed; for Shakespeare, in sight, attracted her with a magnet's charm. She stood before the figure for a time in reverence. She viewed it from all sides, in the changing lights and shadows of a mottled sky, and talked while she walked. The Shakespeare lived to her, and she was familiar, yet solemn in the presence.

"Old fellow, you have done a great deal for me; *a great deal for me*," she repeated, slowly weighing her words and nodding her head. She finally came to a stand and said:

"Here, it has the greatest power of expression and pose." The point of view was quartering, to the north, about forty feet from the base. The inspection over, she was asked what she thought of it, and she replied:

"I think that among all the Shakespeare memorials, public and private, this is the best I have seen."

One of the friends suggested that she might furnish a memento of her visit to the statue by sending a Shakespeare Mulberry to be planted near. Her face lighted up as she replied:

"I shall be too happy! It will be a pleasure, and I feel honored in the privilege."

She then stepped off several paces from the base at the back of the statue, until the distance seemed right, and turning her dainty boot-heel in the sod, she said:

"Soon as I return to England, I shall go to Stratford first, before London, and I promise to send a Shakespeare Mulberry slip, to be planted here."

And when the carriage moved away, her face was turned to the Shakespeare, long as it was in sight.

She never saw Stratford again, and only her dust ever reached England.

The promised Mulberry "slip" never came, but Mr. Henry Shaw furnished a Mulberry tree from his gardens, and he and Mr. N. M. Ludlow, the oldest actor and dramatic manager living, Mr. Thomas Dimmock, one of the "friends," and Thomas E. Garrett, planted the tree at the spot designated, in memory of the great Juliet, Rosalind, Viola, and Imogene—Adelaide Neilson, whose art and person created and embodied the most perfect verisimilitudes of these lovely women of Shakespeare, probably, that the world ever saw.

Mr. Shaw supplemented this act with a marble tablet bearing the inscription, "Mulberry tree planted on the spot marked by Adelaide Neilson, March 25th, 1880."

And the Neilson Mulberry in the place of the "Shakespeare slip," buds, blossoms and bears, and will keep the "little strolling player's" memory green in the years to come.

P. A. K.

DON'T ALWAYS BLAME "POISON IVY"

Many people are surprised to find that "ivy-poisoning," or more properly "contact dermatitis," is often due to other plants than poison ivy and poison sumac *(Rhus Toxicodendron* and *R. Vernix)*. Poison ivy causes skin irritation only when the skin comes in contact with broken surfaces of the plant, or in very susceptible individuals when the skin touches something having the fresh or dried juice of the plant on it. This was the case with those who took "poison ivy" from playing Mah Jong, since the better sets were finished with a fine lacquer made from the sap of an Oriental plant related to poison ivy.

People who "rub against poison ivy without taking it" and at other times are poisoned without coming in contact with it are in reality poisoned by other plants. The most usual plant irritants of this type are the spurges; poinsettias and snow-on-the-mountain, because of their beauty and consequent wide cultivation, cause many cases of dermatitis. Other plants which are common offenders in this region are the sneezeweeds (*Helenium* spp.), Bermuda grass (*Cynodon dactylon*), ragweeds (*Ambrosia* spp.), cockleburs (*Xanthium* spp.), lady's slippers (*Cypripedium* spp.), the cultivated primroses (*Primula* spp.), as well as the cultivated daffodils and narcissus. Radishes, turnips, or other vegetables have, in some cases, been shown to cause poisoning.

If you find that gathering flowers gives you a skin irritation, look for the cause in those flowers and don't blame a hypothetical ivy plant. People who are poisoned when they have not been exposed to a poison-ivy-plant might well be on the lookout for other plants as possible offenders. By use of various skin tests devised during the last few years, physicians are now able to determine the causes of many obscure cases of dermatitis. However, just because plants cause occasional cases of "ivy-poison" is no reason for their being eliminated from all gardens.

For a discussion of the poison ivy plant with illustrations and suggested remedies of the dermatitis see Mo. Bot. Gard. Bull. Vol. XII, No. 7, pp. 87–91. 1924.

FRED A. BARKLEY.

JOTTINGS ON BARK

(For Visitors from Schools)

No, this is not to be an article on picture-writing by the Indians, or the spring sentimentality no longer graven on the bark of favorable trees by ardent young gentlemen. This is to be a rambling discussion on one of the most important dead parts of the living tree—the bark. If the bark were alive it would not be important, but since it is dead we will write its obituary.

The infant stems and roots of most flowering plants are covered by a skin-like layer of cells which protect, restrain, and ventilate the underlying tissues of the plant. Most of our annual plants never get out of the "skin" or epidermis stage. The first few years in the life of a large poplar or oak are spent in the epidermis stage as a twig. It is only when the growth of the wood and the other conducting tissue stretches the epidermis near to the bursting point that the plant does something about the matter. In the layer of cells which underlies the epidermis some kind of a stimulant is received; whether it is the mechanical pressure exerted by the growing tree or or some sort of a substance similar to the hormones of animals, we are not sure. We do know that this layer of cells is stimulated to multiply in a definite and regular fashion. Soon this layer of cells renews its youth and its capability of cell division, and sets to work to lay down the cork which is one of the basic components of the bark. These cork cells are produced to the outside of the stem. Their walls are impregnated with substances which make them air-tight as well as water-tight, and they cut off all sources of food from the cells of the epidermis which soon die. The cork cells themselves lose their living contents and thus increase their insulating capacity.

While the cork-producing layer of cells is dividing to the outside, it sometimes produces cells toward the inside which remain alive and which may eventually carry on the production of the cork itself. Also, the cambium (that efficient growing layer which produces wood to the inside and bast to the outside)

continues to function, crowding the bast outward on all sides and eventually rupturing the epidermis. The corky layer underneath of course keeps the delicate living tissues from drying out, and insulates them to some extent against radical changes in temperature.

The epidermis of young stems is provided with ventilating openings exactly like the stomata which are so commonly found on leaves. With the production of cork ventilation is considered and even anticipated. The lenticels, familiar as the markings on the bark of birch and cherry trees, develop even before the death of the epidermis, and through them ventilation of the inner tissues of the tree may be accomplished. These lenticels may be found on roots—the striking purple lenticels on the orange roots of the mulberry being a good example.

Before we discuss the genesis of the bark of adult trees it will be interesting to examine some apparently useless developments of corky tissue on young stems. The curious thing is that these corky wings and crusts are found on plants of widely differing families. The narrow corky outgrowths of the winged elm *(Ulmus alata)* extend from bud to bud and equal or exceed the stem in diameter. On older stems they seem to be composed of several distinct strata which roughly correspond to the age of the branch. Between the corky ridges lies epidermis-covered tissue of the branch, and at the base of each ridge can be seen the furrow of epidermis plowed up by the superabundant development of cork. Similar cork ridges are found on the winged wahoo *(Euonymus alatus)*, and may be seen on the specimen near the main entrance to the Garden. The black crusts on the young branches of sweet gum *(Liquidambar Styraciflua)* are also corky outgrowths similar in development to those already described.

The bark of adult trees is a somewhat different article from the cork of the younger branch. It is composed of some cork cells, but principally of the changed and non-living cells which have come from the transformation of the outer and worn-out parts of the bast. These cells, originally food-conducting, later insulating, lose their vitality, their walls are impregnated

with substances for which the plant has no need, much of the water is evaporated, and the layer which is called the bark results. Sometimes it is composed principally of cork cells, and if the cork is produced in sufficient quantity the bark is of commercial value.

It is well known that the barks of trees vary. Many are so typical that one does not hesitate to identify the birches, the cherries, the elms, by a glance at the kind of bark sheathing the stem. The small alligator-like scales of the bark in flowering dogwood identify the tree as surely in winter as do the flowers in the spring or the leaves in the summer. The white bark of the paper birch and the yellow bark of the river birch are enough alike to make us say birch on seeing the trees, and are different enough to distinguish them at a glance. The warted hackberry bark is as certain a sign of identification as a garden label could be, while the smooth, sleek, gray beech bark is equally sure. One is hard pressed sometimes to tell the difference between the water beech and the hop-hornbeam when shown the leaves, but shown the bark their identity is quickly made known.

The fissuring of bark is somewhat analogous to the wrinkling of the human countenance. Both are due to age. However, the wrinkling of bark is due to the increasing diameter of the tree accompanied by the inelasticity of the outer layers of the dead bark. The inner layers are more closely accommodated to the tree's girth and are able to keep pace with its waistline. The outer layers are dead, unable to grow, and consequently split into segments which are characteristic for the tree. At times layers of cork are formed which undercut parts of the bast tissue and eventually result in the formation of such loose-hanging bark as one finds on the trunk of the shag-bark hickory. Perhaps in this short explanation you can find the reasons for the particular bark of your favorite tree.

What does the bark do? It has a variety of tasks. It prevents the vital bast and cambium layers from drying out, protects them from excess heat and undue cold, discourages the ravages of fungous diseases, and provides a permanent self-fitting coat for the tree. On its outside it may be the home of

mosses and lichens or the support up which poison ivy and other vines will clamber. It may serve as a cafeteria for the brown creeper, the nuthatches, and other careful, keen-eyed, insect-gleaning birds. On its surface the spores of fungi may grow, and from this headquarters succeed in invading the vital tissues of the trunk.

The substances which fill the cells and permeate the walls of the bark have their uses, too. Without the coating which makes its cells air-tight and water-proof, as well as surprisingly elastic, the cork would be of no use. Some substances render the bark fireproof—did you ever try to burn the big tree bark? Of the things discarded into the bark, some are of the highest economic importance. The tanning of leather has relied for a long time on the bark of oak, chestnut, and acacia, as a source of material. The family of cinchona drugs, of which quinine is an important member, are extracted from the bark of a tree. The best sassafras tea is made from the root bark of our native sassafras.

Perhaps you can think of some other uses, practical and aesthetic for bark. The facts listed above are only suggestions for you to begin with.

JOHN ADAM MOORE.

NOTES FROM THE FLOWER AND GARDEN SHOW, THE ARENA, MARCH 31–APRIL 7

The great American Desert . . . a grizzled old prospector leading his desert canary toward the "pizen" water hole . . . the variety of opuntias . . . the tall stately cereus . . . short, dumpy, red-spined, villanous cacti . . . a prostrate prickly pear which looks very much like our own Missouri one . . . other plants which were not cacti, the century plant, Spanish bayonet, the narrow-leaved grass-like Dasylirion . . . the bleached bones of a long-forgotten horse.

* * * * *

That pretty lavender and yellow-centered Exacum which so much resembles a primula . . . long-stemmed roses that looked

tall even though displayed in the Arena . . . desert gardens in hollowed sections of logs . . . lantana flowers fading from orange to pink as they pass out of bloom . . . the white display of freesias, calla lilies, roses, stocks, carnations, and sweet peas, against a black background . . . the yellow display of tulips, roses, snapdragons, calla lilies, broken only by the white of lilies-of-the-valley . . . the exuberant freshness of the massed hydrangeas.

* * * * *

A bed of eighty varieties of house geraniums from the Garden collection—variety in size, color, leaf-form, and flowers . . . and if your nose knows, many have individual smells. Speaking of smells, the geraniums are quite a fickle assortment, some furnishing nice perfumes; other would discourage, and do, the most ardent bug. The hyacinths, on the other hand, evoked much audible comment.

* * * * *

Imagination, ingenuity, and good taste in the development of pastoral scenes . . . did you see the squirrel on top of that old mossy spring house? . . . lots of moss in the crannies of the wall, but none on the hand-made shingles which roofed it over . . . the pheasants in the brush . . . the lone Bobwhite on guard at the rail fence.

* * * * *

Did you notice the woodland setting, with the heaths in the foreground and an old well at the end of the path, the old oaken bucket ready for good service? . . . the tasteful grouping of the rare native plants, yellow lady's slippers, native ferns . . . birch, maple, redbud, and some rosaceous trees in the background, but all the leaves on the ground were oak!

* * * * *

Amateur's shadow boxes . . . a colorful display of cauliflowers, squash, artichokes, peas, cucumbers, etc., at about 3 p.m. suggested title "Supper at Six" . . . a modernistic sylvan nook with a group of satin-white shelf fungi set vertically before a background of birch-bark, enlivened with mosses

and Boston fern . . . the one in which the host (ess) was interrupted just after he (she) had cut the first lemon as a beginning toward the construction of some punch (?) . . . delightful Wardian cases, particularly that one made from a light bulb . . . a large specimen dracaena bearing a great cluster of many small unnoteworthy and seldom-seen flowers.

* * * * *

The seed-pod zoo . . . a gourd-pig or a pig-gourd whichever way you decided . . . a gigantic spider, also of gourds . . . some bystander claimed that she identified a cockroach among the animals present—maybe it just wandered in . . . the pine-cone turkey . . . the coconut cow with the honey-locust pod horns reminded one of the Cheshire cat . . . that bird of legend, the milkweed stork.

* * * * *

Bright and somber cinerarias . . . brilliant and bronze tulips . . . the living green Irish harp . . . startling great amaryllis that fairly overflowed with color . . . white Easter lilies in the formal gardens . . . red and orange calceolarias in variety galore . . . the tiny edelweiss, of which so much has been said (mostly by those who had only heard of it) . . . Anne Hathaway's thatched cottage in the English springtime.

* * * * *

A peek at the orchids from the Garden's collection . . . *didn't* you have to wait in line? . . . large orchids vying with small ones for attractiveness . . . infinite elaboration of flower form and coloration . . . the breath-taking aeroplane-like view of the jungle setting . . . on the ground our very own superb pink lady's slippers . . . in the trees and in the background the novelties of two hemispheres and all climes . . . massive cymbidiums from India . . . dainty Panamanian dancing girls . . . waxy white phalaenopsis from the Philippines . . . green slipper-type flowers . . . a bold yet delicate orange cattleya . . . a galaxy of tree-top beauties, *and* the "cold-house" plants sent in full bloom by Sir Jeremiah Colman, that looked as though they didn't know they had left England.

JOHN ADAM MOORE.

NOTES

Mr. Ladislaus Cutak, in charge of Succulents at the Garden, spoke before the Topeka Horticultural Society, April 16, on "Succulents (including Cacti) and Water-lilies."

Dr. Carroll W. Dodge, Mycologist to the Garden, gave a talk before the Boy Scouts at St. Mary Magdalene Church, March 14, on "Camping in the Jungles."

Mr. A. P. Beilmann, Arboriculturist at the Garden, gave an illustrated lecture before the Biology Club of Webster College, March 14, on "Native Tree Flowers."

Dr. Morris Moore, formerly Rufus J. Lackland Research Fellow, has received a Guggenheim Fellowship for the purpose of studying pathogenic fungi in South American laboratories.

Mr. G. H. Pring, Superintendent of the Garden, and Dr. J. Horace McFarland, president emeritus American Rose Society, conducted the Question Box at the meeting of the Federated Garden Clubs of Missouri, at the Congress Hotel, April 5.

Dr. George T. Moore, Director of the Garden, spoke at the semi-annual meeting of the Federated Garden Clubs of Missouri, at Kirkwood, April 4, on "Mr. Shaw and His Garden"; and on April 12 he delivered an illustrated lecture on "Some Inside Facts About Plants," in the course of lectures and entertainments at Girard College, Philadelphia, Pa.

Recent visitors to the Garden include Dr. Harry J. Fuller, instructor in botany, and Dr. Constantin J. Alexopoulos, instructor in botany, both of the University of Illinois, Urbana; Dr. J. Horace McFarland, president emeritus American Rose Society, and horticultural publisher, Harrisburg, Pennsylvania; Mr. H. C. Oberholser, senior biologist, Bureau of Biological Survey, U. S. Department of Agriculture, Washington, D. C.

Mr. A. A. Hunter, who has been manager of the Tropical Station, Balboa, C. Z., since the death of Mr. Powell in 1927, died at the hospital in Ancon on Saturday, April 6. Mr. Hunter was associated with Mr. Powell in the early days of his orchid col-

lecting and probably was as familiar with the various stations for these plants as any one who had ever worked there. He was dean of the Canal Postal Service, having served continuously for twenty-nine years.

STATISTICAL INFORMATION FOR MARCH, 1935

GARDEN ATTENDANCE:

Total number of visitors	10,087

LIBRARY ACCESSIONS:

Total number of books bought	63
Total number of books and pamphlets donated	160

PLANT ACCESSIONS:

Total number of plants and seed packets donated	1,420

HERBARIUM ACCESSIONS:

By Purchase—	
Collom, Mrs. Rose E.—Plants of Arizona	16
Degener, Otto—Plants of the Hawaiian Islands	104
Lundell, C. L.—Plants of British Honduras and Guatemala	165
Steyermark, Julian A.—Plants of Missouri	2,290
Weigel, Theo. Oswald—H. Zillig, "Ustilagineen Europas," Lief. XIII and XIV, Nos. 121–140 inclusive	20
By Gift—	
Cory, V. L., by J. A. Steyermark—Plants of Texas	6
Drushel, J. A.—Plants of eastern United States	135
James, R. L.—*Vinca minor* L. from Alabama	1
Lundell, C. L.—Plants of British Honduras and Guatemala	17
Seibert, R. J.—Plants of Missouri	10
von Schrenk, H.—*Taxodium mucronatum* Tenore from Mexico and *T. distichum* Rich. from horticulture	3
By Exchange—	
Clokey, I. W.—Plants of California	175
Morrison, John L.—Plants of Nebraska	202
University of California—Plants of California	320
University of Central Asia, Taschkent—"Florae Asiae Mediae," Fasc. XXI–XXIII, Nos. 501–575 inclusive	75
University of Oklahoma, by G. J. Goodman—Plants of Oklahoma	120
Williams, L. O.—Plants of California and Utah	2
By Transfer—	
Cutak, L.—Plants of horticulture	2
By Field Work—	
Dodge, C. W.—Plants of Panama and the Canal Zone, collected by C. W. Dodge, J. A. Steyermark, and P. Allen	2,072
Total	5,735

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

THE GARDEN, 2315 TOWER GROVE AVENUE, ST. LOUIS, MISSOURI

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REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.
Hove, Sussex, England

MISSOURI BOTANICAL GARDEN BULLETIN

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DOUBLE-FLOWERED RED-BUD (OUTSIDE ROWS) CONTRASTED WITH NATIVE SPECIES (CENTER)

Missouri Botanical Garden Bulletin

Vol. XXIII MAY, 1935 No. 5

NEW OR NOTEWORTHY PLANTS FOR ST. LOUIS. VIII

A DOUBLE-FLOWERED RED-BUD (CERCIS CANADENSIS VAR. PLENA)

About five years ago a letter was received at the Garden from Mrs. Anderson Gratz, stating that for the past ten years she and Mr. Gratz had been much interested in a certain tree on the banks of the Mississippi. Their investigation showed that there was no other like it known in the wild state, and only one in cultivation, a large and old tree in the Royal Botanic Gardens, at Kew, England. They recognized the tree to be a red-bud, but instead of the familiar single flower it bore double flowers as large as a five-cent piece. To a casual observer the tree looked more like one of the cultivated flowering almonds or crabs.

Since this beautiful tree was the only one known and was slowly falling into the river, every effort was naturally made to perpetuate it. Cuttings to be used for grafting or budding were sent to several institutions, among them the Missouri Botanical Garden. After several failures the Garden finally received in 1933 material in suitable condition, and buds were successfully set on the native red-bud stock. Good growth was secured, and this month flowers have appeared, proof that the Garden has at last succeeded in growing this most desirable horticultural variety. The accompanying photograph (pl. 11) shows the great contrast between the flower of the native species and the double-flowered form.

The first reference in the literature to such a tree is apparently in the "Handlist of trees and shrubs grown in the arbore-

tum at Kew,'' published in 1894, where the name *Cercis canadensis* var. *flore pleno* appears. According to Sir Arthur Hill, Director of the Royal Botanic Gardens, this tree died many years ago and there is no record of its history. The name was retained in the second edition of the ''Handlist,'' in the hope that another specimen might be procured, but this hope has never been realized.

In 1897, Sudworth published in Bulletin No. 14 of the Division of Forestry of the United States Department of Agriculture, a list of the flowering trees of the United States. Under the heading ''Variety distinguished in cultivation'' he gives *Cercis canadensis* var. *plena* nom. nov., with the only comment: ''A variety with double flowers.'' Sudworth's name is founded on the one published in the Kew ''Handlist,'' which name is apparently based on the plant cultivated at Kew prior to 1894. In handbooks on trees published in Germany, one by Zabel (1903), another by Schneider (1907), a double-flowered red-bud is recognized either as a variety or form of the common *Cercis canadensis*. However, no information whatsoever has ever been given concerning the locality or character of the tree, other than the double flower, until Mr. and Mrs. Gratz discovered it. Apparently no one had seen the double-flowered red-bud since it disappeared at Kew some forty years ago.

Thus through the keen interest of Mr. and Mrs. Gratz, the Garden is able to add another most interesting form of red-bud to horticulture. In the BULLETIN for June, 1922, will be found a description of the white-flowered form of *Cercis canadensis* which originated in the nursery of John Teas and Son at Carthage, Mo. For thirty-two years the Garden has grown this variety and since obtaining the entire stock of the Teas Nursery, it has been one of the chief sources of supplying the white red-bud to other gardens.

SUCCULENT SPURGES

Members of the great botanical family Euphorbiaceae grow in all parts of the world, and comprise about 4500 species. Some of them grow to be large trees, others are dense bushes,

EUPHORBIA GRANDICORNIS, SHOWING SMALL FLOWERS

EUPHORBIA CAPUT-MEDUSAE

SOFT MAPLE (ACER SACCHARINUM)

1. Scaly bark. 2. Nearly mature seeds. 3. Pistillate flowers on right, staminate on left. 4. Large flowers occurring on tree in Mississippi low land

and frequently they are merely weeds or leafless succulent plants. Many species are poisonous, but quite a few are of economic value, yielding gum, rubber, and oil, and in the drier parts of South Africa certain species are used as stock feed.

Recently great interest in succulent euphorbias has been shown, and an International Euphorbia Society has been organized, with headquarters in California. It can be safely said that in fantastic forms of growth the succulent spurges (exclusive of cacti) cannot be equalled by any other group of plants. In certain sections of Arizona the giant cacti with their gargantuan arms seem to reach for the sun, in Mexico the stately organos rise fifty and sixty feet into the air, but in Africa the great tree-like euphorbias with their branches outstretched like huge candelabras form the characteristic feature of the landscape. The euphorbias, with their grotesque shapes, fill the place in Africa which in America is supplied by the cacti. Because many of the spurges so much resemble the cacti, they are often mistakenly said to belong to the cactus family. However, the cacti are strictly American plants, whereas the succulent spurges, especially the cactiform kinds, are natives to South Africa, Madagascar, East Indies, etc. The stems of all the spurges contain latex-tubes and when cut or injured a copious milky juice exudes from the surface. The juices of the cacti, on the other hand, are usually watery and colorless, and this distinction alone makes it easy to distinguish the two groups. In addition, the flowers of the euphorbias are very insignificant (pl. 12, fig. 1), whereas cactus blossoms are often very large and showy.

For convenience the succulent euphorbias can be divided into three groups:

1. Shrubs or trees of cactus-like habit, as *E. abyssinica.*

2. Shrubs or trees with mostly virgate, leafless branches, as *E. Tirucalli.*

3. Compact plants with short, stout branches arising from a short, fleshy caudex, as *E. Caput-Medusae.*

In South Africa, the genus Euphorbia is represented by over 180 species. Among them the more interesting are the following:

The arborescent *E. Tirucalli* is probably the commonest type grown in cultivation, having a wide distribution in India, eastern Africa, eastern Transvaal, and the coastal belt of Natal. The latex of this species has been utilized in the manufacture of a low-grade rubber and, according to Pammel (Manual of Poisonous Plants), it is also used as a fish poison. The cheapest and best source of rubber, however, was obtained from *E. Intisy*. In this species of Euphorbia the latex, which freely flowed from any gash, quickly coagulated and formed ideal raw material for auto tires, etc. At one time intisy grew in profusion on the island of Madagascar, but in less than seven years, due to the ruthless commercial exploitation, the plants became almost extinct.

The juices of the various spurges, especially of *Euphorbia virosa*, *E. heptagona*, and *E. bupleurifolia*, were used by the natives to poison their arrows. *Euphorbia Caput-Medusae* is very aptly named, for the short, wavy branchlets from the thick, head-like stem suggest the hair of writhing snakes on Medusa's head (pl. 12, fig. 2). The crown of thorns *(E. splendens)* is a very beautiful thorny shrub, covered for the greater part of the year with scarlet flowers. Just as in Mexico, certain tall, columnar cacti are grown as impenetrable hedges, in Africa some of the spurges serve the same purpose.

Because the juices of the various euphorbias are more or less toxic they will produce irritation of the skin unless washed off immediately. The writer on many occasions (especially at pruning time) happened to get some of the milky exudation on his arms, and it caused a burning and itching sensation which lasted for a few days. Care should be taken not to get any of the sap in the eye, as partial blindness for a time may result.

L. C.

COMMON NATIVE TREES OF MISSOURI. I

THE SOFT MAPLE (ACER SACCHARINUM L.)

Due to an increasing interest in trees, there will be published from time to time in the BULLETIN descriptions of some of the common trees native to the Middle West. Photographs rather

than technical terms will be used, so that the amateur may use the descriptions for identification purposes in all seasons.

The soft maple (*Acer saccharinum* L.), because of its common occurrence as a street and lawn tree and because it is the first of the native trees to flower in spring, will be described first. Long before the last snow of winter—in some seasons, the first week in January—soft maple can be found unfolding its flower buds. So long as the weather remains mild, it bravely continues flowering. If inclement weather intervenes, all activity ceases and the flower buds remain unchanged until warmer weather. Thus the flowering season may extend from early January until late March. Its habit of waiting for suitable weather is largely responsible for the fact that almost every year the maple produces some seed. In many seasons only certain branches will mature seed; these bore the flowers which developed during warm weather, while those produced on other branches were frozen.

Each year is heard the remark that the "maples are forming buds." The implication is that these trees are now actively growing and forming buds for the coming summer. This, of course, is not true, for trees do not grow during winter. A careful consideration of the time during which the buds unfold indicates that the tree must have been in active growth during the coldest weather of winter, or that the buds were formed the previous summer and are now merely enlarging. An examination of the branches during late summer discloses fully formed buds lying dormant awaiting the spring. Since they are present for the greater part of the year—longer than leaves, flowers, or fruit—they become one of the most reliable means of identification. Of the native trees only the ash and maple have opposite buds, but the ash has heavy gray branches with large black or brown buds while the maple has finer red or brown branches, with whorls of flower buds. Moreover, in the maple the terminal bud is present, which is sharp-pointed like the axillary leaf buds and shows four red or brown shiny scales.

In early spring the flowers are the most interesting feature of the maple. All flowers occur in crowded axillary fascicles

on wood produced the previous season. Those produced on the lower branches are usually red or even purple in color. These are the pistillate (seed-bearing) flowers. They are much better known than the staminate (pollen-bearing) flowers which usually are found only in the top of the tree (pl. 13, figs. 3-4). These consist chiefly of a long transparent filament to the end of which is attached the yellow anther. In the low land along the Mississippi River, where soft maple occurs in large groups, no staminate flowers are found lower than thirty-five feet above the ground. Since this tree is wind-pollinated it appears that this is due solely to insure a longer journey for the ripe pollen. A group of soft maples may for years produce only pistillate flowers, but later, when the proper height is attained, staminate flowers make their appearance in the upper branches.

Of no less interest than the flowers and buds are the winged seeds, each of which contains an entire tree—root, stem, and leaves. In many seasons the seeds are nearly mature before the leaf buds open, and thus it appears that the production of seed in this tree is wholly at the expense of the stored food. The entire seed is green in color and ready for immediate germination. All that is required is water—a constant humidity, but not submergence. The seeds will not germinate in dry soil or if allowed to dry before planting. The critical water requirements of the seed has determined to a large extent the choice of a habitat. The soft maple is found only along the larger rivers in this state, but it will adapt itself to a drier locality. In old specimens the bark is fissured forming long scaly plates (pl. 13, fig. 1), which in dry weather have a tendency toward curling. The bark is very thin and therefore subject to serious injury by fire.

A. P. B.

ECONOMIC USES OF PLANT SAP. III

BEVERAGES

In addition to providing an abundance of food, plants yield a wide variety of saps or juices which the thirsty people consume either in the natural state or as refined beverages. These extracts are obtained from all parts of the plant, the roots,

stems, leaves, flowers, fruits, and seeds. In some plants the sap is taken directly from the stem or trunk by the usual tapping methods, while in others the juices are expressed from the fruits, or the leaves are ground up and steeped to make the desired drink. Such practices are common the world over, and every country has its favorite beverages. Even in the depths of the jungle natives prepare special drinks from the vegetation, which if partaken by the unaccustomed person would doubtless relieve him of all further responsibility.

Beverages may be alcoholic or non-alcoholic. The former do not occur as such in nature, but as might be expected the ingenious human mind has perfected fermentation and distillation processes that convert mild, wholesome plant extracts into powerful liquors. The art of preparing exhilarating or intoxicating beverages is by no means a recent one. Records indicate that the ancient Egyptians, Greeks, and Romans, as early as 450 B. C., made wine and beer and regarded them with great favor. The people of Spain were particularly skillful at brewing many centuries ago, and the natives of Africa and Abyssinia have made strong liquors of various kinds for ages.

In Japan and China a very popular wine called "sake" is prepared from rice. A favorite drink in Mexico is "pulque," the fermented juice of the century plant (*Agave* sp.). When the century plant is about to bloom, the central bud is removed and the sap flows into the cavity. It is collected frequently and when allowed to ferment forms a very intoxicating liquor. In Russia a strong drink called "vodka" is made from potatoes and maize.

The most popular beverage of tropical and semi-tropical countries is "tari" or "toddy" which is made from the sap of the sago palm *(Arenga saccharifera)*. The spadix of the inflorescence is cut off a short distance from the base and the sap which runs out is collected in pots. When fresh it is a clear liquid with a taste similar to must, but it quickly ferments and develops into an intoxicating liquor, in which form large quantities are consumed. In England the birch, maple, and ash trees were at one time tapped and their saps used to make beer. The liquid contained in unripened cocoanuts is a very refresh-

ing and nourishing beverage, a single cocoanut sometimes containing one or two pints of juice. A popular drink in the sugar-cane regions is rum. It is made from molasses, sugar-cane pulp, or the skimmings which accumulate during the refining of sugar. There are two kinds of rum, Jamaica and Demerara. The latter kind is lighter in flavor and not so popular as the Jamaica rum, which is prepared by the fermentation of the sugar-cane residue. After fermentation, which requires twelve days or longer, the product is distilled to produce a strong liquor. Demerara rum is made by fermenting molasses in water, followed by distillation.

The favorite non-alcoholic beverages in the United States are coffee, tea, and cocoa (cacao) or chocolate. Large quantities of these stimulating drinks are used in this country and seldom are they absent from festive occasions. Although coffee, tea, and cocoa beverages are not made directly from plant sap, the essential ingredients are substances which originate from the sap, and it seems appropriate to include them in the present article.

The custom of coffee drinking appears to have originated centuries ago with the Arabs, and since then it has spread all over the world. The annual production is now over 3,000,000,000 pounds, of which Brazil grows about 60 per cent. The United States uses nearly one-half of all the coffee raised, with a per capita consumption of 12 to 13 pounds a year. Coffee is a delightfully refreshing beverage prepared from the beans (seeds) of the coffee tree *(Coffea arabica)*. *Coffea liberica* and *C. robusta* are cultivated in some regions, but *C. arabica* is superior in quality. This tree grows best on the border of the tropics, and Brazil apparently is an ideal region for its cultivation. The coffee tree is not permitted to grow to its natural height in order to facilitate the picking of the fruits or coffee cherries. These are about one-half inch long and red in color, and within each cherry there are usually two beans, the flat sides together. After picking, the pulp is removed by machines and by soaking in water. The beans are then spread out in the sun to dry or else exposed to artificial heat. The thin outer skin is now removed and the beans polished. The raw coffee is shipped to

market and roasted near the place of consumption, roasting developing the characteristic flavor and aroma of coffee. Most brands of coffee are blends of various kinds. Coffee beans when pulverized and soaked in hot water make a mild stimulating beverage containing a small percentage of caffeine and a volatile oil which impart the aromatic qualities.

The origin of tea in China is lost in antiquity, but it was hardly known in England until 1650. As a beverage it assumed considerable political importance in the United States, culminating with the famous Boston Tea Party. The world production of tea now approximates 1,764,000,000 pounds a year, China, British India, Dutch East Indies, Ceylon, and Japan being the principal sources. Great Britain uses vast quantities of tea, about 8 to 9 pounds per person a year, while the United States uses only about 0.8 pound per person. Tea is obtained from the leaves of the tea shrub *(Thea sinensis)*. The leaves may be picked after the shrub is 3 to 6 years of age, and the plant can be cropped for about 50 years. The young leaves are usually picked several times a year. For black tea the leaves are allowed to wither and ferment slightly, then dried. Green tea is made by drying the leaves more quickly and not permitting them to ferment. Tea contains a small amount of caffeine which dissolves out readily in the presence of hot water. This stimulating element, in combination with other substances from the leaves, imparts to tea its characteristic taste and aroma. Considerable tannin (the substance used to transform hides into leather) is also present in the leaves, and is extracted by prolonged boiling. Consequently, boiled tea is bitter and harmful. Steeping for a brief time removes all of the desirable constituents from the leaves with only a trace of tannin.

The cacao tree *(Theobroma Cacao)* is native to Mexico, Central America, and parts of South America. The regions of production now center in the west coast of Africa, Brazil, and Nigeria, the annual production being about 1,000,000,000 pounds. Cacao came into use in England about the same time as tea and coffee. Its wide acceptance is in part due to the fact that it is not only a delicious beverage but also a nutritious food.

The cacao tree grows 20 to 40 feet tall. On the trunk and branches cucumber-shaped pods occur which contain the cacao beans or seeds, 20 to 45 in number. The trees start to bear when 3 to 5 years old and may produce two crops a year for 50 years or more. The pods are cut off with a knife and split open. The beans are then scooped out and fermented prior to drying, becoming red in color and aromatic. Cacao contains oil, starch, and protein, as well as a small amount of theobromine and caffeine. The beans are roasted and ground up to make cocoa and chocolate, the latter containing more oil. The United States consumes about 3 pounds of chocolate and cocoa per person a year.

In Africa and the West Indies "cola" is a popular non-alcoholic beverage. Brazil has "guarana" and Paraguay its "yerba mate." These drinks are used like coffee and tea in other countries.

Fruit juices are valuable from a health standpoint. Piña is a sweet and palatable drink made from the juice of the pineapple. Orangeade and lemonade are of course well known. Recently, tomato juice has assumed some prominence as a beverage in the role of an appetizer. The expressed juice of apple forms a popular drink known as cider. Unless fermentation is prevented, cider soon develops a perceptible alcoholic content and may finally turn to vinegar.

The juice of grapes is an important beverage in this country. If allowed to ferment, the sugar in the grape juice is converted into alcohol, and wine is formed. In dry wines practically all the sugar is eliminated by fermentation. The color and composition of the liquor depend upon the kind of grapes used and the methods of preparation. Distillation of wine produces brandy which has a high alcoholic content.

Other mildly intoxicating liquors may be made from elderberries, rhubarb, cherries, and dandelions. Whisky, gin and beer are made from various cereals involving the conversion of starch to sugar, and sugar to alcohol.

D. C. F.

NOTES

Mr. Paul A. Kohl, Floriculturist to the Garden, spoke before the Eastern Star of Kirkwood, Mo., April 15, on "Roses."

Dr. Hermann von Schrenk, Pathologist to the Garden, spoke at the banquet of the Triangle Club, Chicago, April 27, on "The Experiences of a Timber Engineer."

Dr. J. M. Greenman, Curator of the Herbarium, spoke at the annual meeting of the Illinois State Academy of Science, at Bloomington, May 3, on "The Genus Senecio in Illinois."

The University of Illinois Library School, on its annual inspection trip to libraries, printing and engraving establishments, visited the Missouri Botanical Garden Library, April 18.

Mr. George H. Pring, Superintendent of the Garden, gave an illustrated lecture before the Webster Groves Parent-Teachers' Association, April 11, on "Annuals and Perennials."

The annual flower sermon, for which Henry Shaw provided in his will, was preached at Christ Church Cathedral, May 12, by the Rt. Rev. Edward L. Parsons, D.D., Bishop of California.

The final district meeting of the Leadership Training Course for Men sponsored by the National Headquarters of the Boy Scouts of America was held at the Garden Arboretum, Gray Summit.

Dr. George T. Moore, Director of the Garden, spoke at a meeting of the Board of Directors of the East St. Louis Chamber of Commerce, at the Broadview Hotel, East St. Louis, May 10, on "Illinois' Responsibility for St. Louis Smoke."

Recent visitors to the Garden include Dr. W. O. Richtmann, associate professor of pharmacy, University of Wisconsin, Madison; Dr. Ralph W. Chaney, research associate, Carnegie Institution of Washington; Mr. Anton Hogstad, of New York, formerly Pharmacognosist to the Garden; Mrs. James Ingraham (Dr. Martha L. Beardsley), of Philadelphia, formerly instructor in botany, Henry Shaw School of Botany; and Mr.

Samuel Woodley, executive assistant of the American Association for the Advancement of Science.

Mr. A. P. Beilmann, Arboriculturist to the Garden, is the author of a paper entitled "The Feeding of Shade Trees," constituting the April number (Vol. 8, No. 4) of the Shade Tree, Monthly Bulletin of the New Jersey Federation of Shade Tree Commissions.

Mr. L. P. Jensen, Manager of the Garden Arboretum, addressed the citizens of Boles Township, Franklin County, Mo., at Gray Summit, in behalf of the Franklin County Regional Plan Association, on "Soil Erosion"; on April 27, he spoke before the St. Louis Naturalists' Club, on "Twenty-five Years' Progress in Regional Planning," and on April 30, he gave a talk, illustrated with lantern slides, on "Roadside Improvement" at a joint meeting of the Henry Shaw Gardenway Association and the U. S. 66 Highway Association, at Sylvan Beach.

The second number of Volume XXII of the ANNALS OF THE MISSOURI BOTANICAL GARDEN was issued in May, and contains the following papers: "Studies in the Apocynaceae. IV" (second installment), Robert E. Woodson, Jr.; "Cytology of *Geotrichum versiforme* Moore," "Head Infection Caused by a New Hemispora: *H. coremiformis*," and "A Morphological and Physiological Study of Two Species of Posadasia," Morris Moore; "An Improved Apparatus for the Determination of Carbon Dioxide Production in Physiological Plant Studies," F. Lyle Wynd; "New Species of Hydnangiaceae," S. M. Zeller and C. W. Dodge.

STATISTICAL INFORMATION FOR APRIL, 1935

GARDEN ATTENDANCE:	
Total number of visitors	**28,053**
LIBRARY ACCESSIONS:	
Total number of books and pamphlets bought	36
Total number of books and pamphlets donated	327
PLANT ACCESSIONS:	
Total number of plants donated	162
Total number of packets of seeds donated	900

HERBARIUM ACCESSIONS:	
By Purchase—	
Degener, Otto—Plants of the Hawaiian Islands	34
Killip, E. P.—Plants of Peru, collected by G. Klug	125
Lundell, C. L.—Plants of British Honduras, collected by Percy Gentle	42
By Gift—	
Barkley, F. A.—Fungus from Oklahoma	1
Cheney, J. S.—*Tradescantia hirsuticaulis* Small from Arkansas	2
Donat, A.—*Ophioglossum* sp. from Argentina	1
Fassett, N. C.—*Tradescantia* spp. from Wisconsin	4
Moeller, Mrs. Andrew—*Malus spectabilis* Börkh. from horticulture	1
Moore, D. H.—*Tradescantia* sp. from Arkansas	1
Parks, W. B.—*Rhus* spp. from Texas	18
Pring, G. H.—*Caulanthus inflatus* Wats. from horticulture	1
Roberts, H.—*Ricciocarpus natans* (L.) Corda from Missouri	1
Teodorowicz, Felix—Hymenogasteraceae from Poland	2
von Schrenk, H.—*Pinus echinata* Mill. and *P. Taeda* L. from Arkansas	4
Webster Groves Nature Study Society—Plants of Kansas, Colorado, and New Mexico, collected by S. L. O'Byrne and J. M. Magner	118
Williams, L. O.—Plants of Missouri	48
By Exchange—	
Brooklyn Botanic Garden—Plants of eastern United States	180
University of Michigan by S. B. Mains—Plants of Central America	140
University of Oklahoma by George J. Goodman—Plants of Oklahoma	109
By Field Work—	
Allen, P. H.—Plants of Panama and the Canal Zone	1,351
Total	2,183

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

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Hove, Sussex, England

MISSOURI BOTANICAL GARDEN BULLETIN

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SENECIO CONFUSUS

Missouri Botanical Garden Bulletin

Vol. XXIII JUNE, 1935 No. 6

NEW OR NOTEWORTHY PLANTS FOR ST. LOUIS. IX

SENECIO CONFUSUS, A NOVEL HOUSE PLANT

Few natural families of flowering plants furnish more attractive subjects for horticultural purposes than the Compositae. Some of the best known and most important examples are chrysanthemum, aster, dahlia, cosmos, cineraria, and calendula.

A little-known member of this family, but one which has considerable promise as a conservatory and house plant, is *Senecio confusus* Britten, "the Mexican trailing groundsel," which is well shown by the accompanying illustrations (pls. 14 and 15). This plant is a native of Mexico, having been discovered a little more than a century ago by the famous collector, Jean Louis Berlandier; but it is only within the last few years that it has been brought into cultivation.

In its native haunts of Mexico this plant grows as a vine scrambling over shrubs and other low forms of vegetation; the petiolate leaves are ovate, about three inches long, more or less toothed, and somewhat fleshy in texture. It blooms profusely under cultivation, producing showy flowers in large heads which in turn are disposed in leafy paniculate clusters. Each head is approximately two inches in diameter. The "rays" or strap-shaped corollas of the outer flowers of the head are a deep orange-red, and the flowers of the center of the head are lemon-yellow tinged with red. A very striking color-contrast is thus made between the orange-red blossoms and the rich dark green glossy leaves.

Propagation of *Senecio confusus* is easily effected by cuttings or by layers, and the young plant grows readily in a rich

loamy soil. It is particularly well adapted for hanging baskets or suspended flower pots from which the long branches hang gracefully for a length of three feet or more. The pliable stems may also be trained to cover a wire trellis of almost any form. J. M. G.

ORCHIDS THAT GROW DOWNWARDS

In the May, 1934, "Orchid Review" the question is raised whether orchids ever grow head downwards. While the general opinion was that there were none which grew in this fashion, the author cites *Cattleya citrina* and *Scuticaria Steelii* as growing thus. Continuing the discussion in the "Orchid Review" for July, Dr. W. Bulhart of Munich claims that there are not many orchids which grow head downwards, adding only three Epidendrums to the list. The recent flowering of *Cattleya citrina* at the Garden (pl. 16) again calls attention to this question, and has led to a re-examination of the whole matter.

Observations made in Central and South America during several collecting expeditions indicate that the downward habit of growth is uncommon. However, many orchids attach themselves to branches, their position being vertical at first but becoming pendant with increased seasonal growth. Examples are *Rodriguezia secunda*, *Oncidium flexuosum*, *Aspasia Rousseauae*, *Brassia longissima*, *Bulbophyllum vinosum*, Maxillaria, Ornithidium, Scaphyglottis, *Epidendrum fragrans*, and *Ionopsis utricularioides*. Many orchids which grow vertically may produce downward flower spikes, the typical example being Stanhopea which is always regarded as epiphytic in habit. Despite this fact, the writer observed *Stanhopea Wardii* var. *amoena* in the Chiriqui region (4000 feet elevation), growing under small trees in deep-leaf soil, under which conditions it would be impossible to produce downward spikes.

Orchids which typically produce their flowers upon downward-growing spikes include Coryanthes, Acineta, *Odontoglossum citrosmum*, Gongora, etc. Such genera as Aerides, Renanthera, Epidendrum, and Dendrobium, which have become naturalized upon trees in our Tropical Station, Canal

FLOWERING BRANCH OF SENECIO CONFUSUS

CATTLEYA CITRINA

Zone, become pendant with age, although their growth is primarily vertical. Downward growth is well illustrated by *Brassavola lineata*. Plants of this species were found in the Chiriqui on the under side of branches, the rat-tail leaves hanging down two feet and the rhizomorphous growth continuing in one plane on the under side of the branch. Another example is *Oncidium stipitatum* which prefers the main trunk of trees. In this instance the minute pseudo-bulb is horizontal, but the rat-tail leaves grow downward. The flower spikes are slightly pendant, not hanging down like those of the Stanhopea.

Cattleya citrina, a native of Mexico, is without doubt the best example of downward habit of growth of both plant and flowers. Living specimens of this species were first exported from Mexico in 1838 by Robert Smith to the collection at Woburn Abbey, England, where it flowered the following year (Bot. Mag. *pl. 3742*). The small bulbs are encased by grayish white bracts, and the leaves have a white glaucous surface. The flowers are thick, waxy, of a bright yellow color, with a pleasant odor. The plant is easily recognized by its onion-like growth. A London costermonger, passing through the orchid house at Kew, noticed a plant suspended from the roof and exclaimed: "Lor' blimey, Liz, there's blooming onions growing on wood"! G. H. P.

NEW OR NOTEWORTHY PLANTS FOR ST. LOUIS. X

SOBRALIA POWELLII

Probably no single group of plants has given rise to so many romantic stories of discovery as the orchid. One such plant, the rare and beautiful *Sobralia Powellii*, has only now yielded the secret of its original home and at last settled the question as to its habit.

During his lifetime the late Mr. C. W. Powell, Manager of the Tropical Station at Balboa, frequently passed the balcony of a native home in Panama City, on which grew a strange plant with large milk-white flowers. For years the owner refused to part with her treasure, but finally because growing in soil in a tin can did not seem to be the most favorable condition,

she sold it to Mr. Powell. It proved to be a new species of Sobralia and was named by Dr. R. Schlechter, of Berlin, *Sobralia Powellii*, in honor of the man who had introduced it into the botanical world. The native woman steadily refused to reveal its origin, and it was only after the death of Mr. Powell that she confessed the plant had been stolen from the garden of General Goethals. This left the matter of the original home of *S. Powellii* just where it had previously been—nowhere—and until a few months ago the world's supply of this marvelous orchid consisted of but a few plants propagated from the original obtained by Mr. Powell and growing at the Balboa Tropical Station.

During the progress of work on the Madden Dam in Panama, north of the Canal Zone, a friend sent the late Mr. Hunter, then Manager of the Tropical Station, a collection of orchids among which were several Sobralias. It was not until one of these plants unfolded its striking white flowers that the first clue was obtained as to the probable locality from which *S. Powellii* had come. From then the hunt was on. Mr. Hunter suspected that the plant would be found in the jungle near the head-waters of the Rio Boqueron, one of the tributaries of the Chagres River, and we started out to find it. Instead of having to cut our way through the almost impenetrable jungle, we were now able to make the trip in a native dugout, thanks to the Madden Dam having flooded the area in question. Laboring through numerous violent squalls, the head of lake navigation was reached on the second day. The men then cut poles and drove the cayuca up through boiling rapids for another half day, reaching an absolutely unexplored region. The next day broke most unpromisingly, violent tropical rain beating down on the jungle top. Following the trail made by our guide we struggled along slippery clay ridges or through fast streams, always with the heavy jungle before and around us and incessant rain drenching us. Finally after many miles we again struck the river which this time was flowing through canyon-like gorges. Collecting of any sort had been poor, and it seemed that we were to be unsuccessful so far as our chief quest was concerned.

SOBRALIA POWELLII

NATIVE HOME OF SOBRALIA POWELLII

ANTHRACNOSE ON SYCAMORE TREE

Arriving at the brink of a pool, it was decided to give up the search, since the time already spent was greater than we had calculated upon. Since I was already soaked to the skin I jumped into the pool, clothes and all. Climbing out on the opposite side my astonished gaze was met by a plant with great milky white buds nearly ready to open. The long-sought prize, *Sobralia Powellii*, had been found. Its native home was no longer a mystery (pl. 17, fig. 2). Furthermore, there was no longer a question as to its habit. This orchid is truly epiphytic, and not terrestrial as was at first supposed. After searching feverishly the surrounding territory, three more plants were found, so there are now about a dozen plants of this rare orchid at the Tropical Station and one small plant at the Arboretum at Gray Summit. Upon returning to the Station we found that one of the other plants had obligingly flowered so that it might have its picture taken for this article (pl. 17, fig. 1).

PAUL ALLEN.

A SERIOUS DISEASE OF THE SYCAMORE (GNOMONIA VENETA)

Not for many years have the sycamores been so seriously defoliated by anthracnose. This disease is caused by one of the sphere fungi, *Gnomonia veneta* (Sacc. & Speg.) Kleb., and was first described in 1848. It is of common occurrence in the Mississippi Valley, and some infected trees are found in the river bottoms each spring. The continued wet weather this spring furnished ideal conditions for its spread. At the present time it has reached epidemic proportions, scarcely an uninfected tree being found within 50 miles of St. Louis (pl. 18).

The first indication of the presence of anthracnose is the wilting of the newly opened foliage, the initial attack having been made on the petiole of the half-grown leaves. The advent of sunny dry weather usually halts the spread and the only damage done is that the sycamore is slightly delayed in coming into full foliage. If, however, the weather should remain cloudy and humid, as happened this year, the disease spreads downward from the first leaf, enters the new shoot, and causes

its death. Within a few weeks the entire tree is defoliated, and as a result much weakened and exposed to attack by other enemies.

Anthracnose can be controlled by spraying with Bordeaux, the first application to be made as the leaves unfold in April. Additional spraying should be done during May to insure complete coverage of the continually unfolding foliage and to replace whatever spray might have been removed by rain. The disease varies in its intensity with the rainfall of April and May, the wetter the spring the greater being the danger of defoliation.

One of the most striking features of anthracnose this year is its almost complete absence from trees within the range of the St. Louis smoke-pall. Completely defoliated trees cannot be found within several miles of the city limits. This may be due to the efficiency of smoke as a fungicide. Anthracnose makes its appearance with the opening of the buds in spring, at which time the city is still clothed in a smoky mantle. It thus appears that the smoke-begrimed city trees are spared from attack by virtue of their very dirtiness. Later, perhaps Nature will evolve a smoke-resistant strain of anthracnose and spraying of city trees will become necessary. A. P. B.

PRESENTATION OF THE HENRY SHAW GOLD MEDAL TO SIR JEREMIAH COLMAN, BART.

In recognition of the interest which Sir Jeremiah Colman manifested in sending to the Garden a collection of rare orchids to be displayed at the Greater St. Louis Flower and Garden Show, March 30 to April 7, the Board of Trustees voted to award him the Henry Shaw Gold Medal (described and pictured in the January, 1933, BULLETIN, page 3, plate 1). This medal, designed by Victor Holm, was awarded for the first time to the Garden at the National Flower Show held two years ago but naturally was not bestowed, so that this is the first time it has been presented. There is a peculiar fitness in the medal being awarded in England, inasmuch as England was the birthplace and boyhood home of Henry Shaw.

Gatton Park, Surrey, the estate of Sir Jeremiah, is one of the most notable in England, both on account of its lovely gardens and unusual landscaping. Although in reality but one large garden, lawns, trees, and shrubs divide it into its component parts of Japanese garden, rose garden, rock garden, herbaceous garden, and other special plantings. But it is the contents of the orchid houses from which came the plants exhibited in St. Louis that deserve special mention. Rich in botanical species, as well as choice hybrids, Sir Jeremiah's is one of the outstanding collections of the world. Of hybrids alone, new specimens of Cymbidium, Dendrobium, Odontoidea, and Coelogyne have been produced through the skill developed at Gatton Park, many of them having received First Class Certificates from the Royal Horticultural Society. Medals and cups almost without number have from time to time been awarded to Sir Jeremiah for new creations or special displays of orchids. He also has had conferred upon him the Victorian Medal of Honor in Horticulture, a highly coveted distinction.

The following letters recently received from Sir Jeremiah and Mr. Gurney Wilson, European Representative of the Garden, give interesting details of the presentation of the medal, as well as the appreciation with which it was received.

Gatton Park, Surrey, 22nd May, 1935.

Dear Dr. Moore:

I have cabled you today my great appreciation of the beautiful gold medal which has been awarded to me for my group at the St. Louis Exhibition. It is a far higher tribute than I could have dreamed of and I hope you will take an opportunity of conveying to your Society my very real appreciation and let the donors know how greatly I value it. It is especially pleasing to me, as for some time past I have rather laid myself out to encouraging increased interest in orchids in far distant lands and it is very nice to have this recognition of my efforts, which, however, I hope will result in a greater interest and improvement in this noble family of plants. Mr. Gurney Wilson presented the medal with due formality at the meeting of the Orchid Committee of the Royal Horticultural Society in the center of the orchid tent with its beautiful surroundings and in the presence of many distinguished horticulturists. He made a very appropriate speech and both he and myself endeavored to impress upon those present that it was not merely a personal award but that it had an international touch and evidenced the growing appreciation and interest which is being taken in orchids. I

may say that I have heard from quite independent sources that my group proved a success. It was a bit of an anxiety but "All's well that ends well," and I was very glad to find that what I sent stood the journey so well.

With kind regards,

Yours faithfully,

JEREMIAH COLMAN.

Hove, Sussex, 22nd May, 1935.

Dear Dr. Moore:

I have pleasure in stating that the Henry Shaw Gold Medal was formally presented to Sir Jeremiah Colman on the occasion of the R. H. S. Orchid Committee meeting at Chelsea Show on Tuesday, 21st May. After briefly referring to Sir Jeremiah's sportsman-like nature in sending a collection of orchids in flower to St. Louis, and to the success which attended the venture, I explained the good work that Henry Shaw accomplished years ago in forming the Missouri Botanical Garden, and how in gratitude for it the Gold Medal bearing his name had recently been instituted.

The Committee were delighted with the honour conferred upon their Chairman, and they applauded heartily. Sir Jeremiah then replied very appropriately, expressing in warm terms his great appreciation of the medal that had been presented to him. Throughout the remainder of the day he was continuously requested to allow one or more of his friends to view and handle the trophy. Earlier in the day I showed the medal to Lord Aberconway, President of the R. H. S., and to several members of the Council, including Sir Arthur Hill, Director of Kew Gardens. Every one considered the medal was beautifully designed.

Mr. Robert Roland, Treasurer of the American Orchid Society, was invited to join the Orchid Committee, and he was present at the Henry Shaw ceremony. Sir Jeremiah Colman has cabled a few words of appreciation, and is writing a personal letter of thanks. No one at Chelsea Show seemed better pleased than Sir Jeremiah and I can assure you that he very greatly treasures this elegant trophy.

Yours sincerely,

GURNEY WILSON.

NOTES FROM THE REPRESENTATIVE IN EUROPE

International "Flora," Heemstede, Holland.—At decennial periods the ancient town of Heemstede, Holland, celebrates its horticultural activities by holding an International "Flora," mainly to demonstrate the progress which is being made in the breeding and cultivation of tulips, hyacinths, and other bulbs. The show ground covers an area of about fifty acres in a well-

wooded estate that is lent by the Corporation of Heemstede; it is, in fact, a suburb of Haarlem, the geographical and historical centre of the bulb-growing district of Holland.

The 1935 "Flora" comprised five successive sessions. The first, opened on March 15, was mainly devoted to early-flowering bulbs, such as the hyacinth, narcissus, crocus, and amaryllis. Noteworthy on the occasion was an extensive group of hyacinths with a background of cherries, forsythias, and lilacs. The second session covered the period March 29 to April 7, at a time when the cyclamen and hydrangea were at their best. A few days later the third session opened with a display of later-flowering plants; and the fourth session, April 26 to May 5, was especially for the display of azaleas and orchids. The fifth, and final, session covered the period May 10 to 19, and afforded the many visitors an opportunity of seeing the magnificent display of tulips. The official estimate of five million tulips in full bloom did not by any means seem to be an exaggeration. Although the various trade growers supplied the bulbs and were individually responsible for planting the respective beds, both of geometrical design and otherwise, the whole scheme was worked out in a manner that produced a most artistic effect as regards color arrangement, especially when viewed from an elevated position. From pure-white forms, the colors ranged through cream and yellow to pink, crimson, and purple. Outstanding varieties were "The Bishop," purple with crimson shading; "Black Eagle," of dark purple color; and "La Tulipe Noire," which appeared almost black. Particularly pleasing was a variety bearing the appropriate name "Peach Blossom."

Part of the exhibition buildings consisted of a glass-roof shelter 300 feet long by 36 feet wide, under which were planted some of the more delicate and newer varieties of tulips. Many of the blooms were borne on stems three feet in height, while the floral segments were also much above the normal size.

Full advantage was taken of the natural surroundings, and under the tall trees there were many attractive displays. For example, a batch of 4,500 *Narcissus poeticus* var. "Horace" created a snow-like effect, while equally pleasing was a batch of

2,500 bulbs of the variety "Cassandra." Another part of the ground was rendered attractive by many hundreds of Tulip "Pink Giant," of bright pink color, but so large that they seemed liable to be damaged by strong winds. A Darwin tulip named "Greuze," with segments of rich purple shaded crimson, made a particularly fine display, for as the sun rose in the sky all the hundreds of flowers turned gracefully towards it.

The bulb fields of Holland occupy a long strip of land bounded on one side by the dunes, the sandhills that protect the coast from the sea, and on the other side by polders (land reclaimed by draining the lakes and marshes). Formerly an inner range of sand dunes covered the ground now used for bulb growing, but as the industry increased the sand forming these dunes was removed till the level was reached at which successful cultivation could be accomplished. It is this sandy soil, when well manured, which proves such a successful medium for bulb culture. The fields are divided by canals and ditches, while thick hedges protect the plants from cold winds. The ground is dug over in autumn or winter, and during the first summer is usually occupied by a crop of potatoes or peas. The beds are about three feet in width, intersected by paths a foot wide. The bulbs are planted in autumn, and in winter are covered with reeds or straw to protect them from frost, and also to prevent the sandy soil being blown away by the wind. In spring, when new growth is active, the protective material is removed and piled up in hay-stack style.

For more than three centuries the people of Holland have cultivated bulbs with conspicuous success, and at the present time upwards of 17,000 acres are devoted to this branch of horticulture. During the flowering period the district presents a glorious sight, and numerous visitors take advantage of the motor-drive arrangements. Aeroplane trips are now available for gaining an even better view of this many-colored picture. At this year's "Flora" a model bulb farm and hay-stack proved quite an attraction.

Visitors to Holland are occasionally struck by the sight of a man carrying an immense open umbrella as he walks through the bulb fields on a sunny day. The explanation of the occur-

rence is that only in the shade can diseased bulbs be detected by the condition of the leaves. Diseased bulbs so discovered are dragged out by means of an iron hook and destroyed.

In proximity to the show buildings there were several exhibits of interest. Messrs. Wezelenburg, of Hazerswoude, arranged 200 evergreen shrubs, including *Ligustrum japonicum rotundifolium*, with thick, leathery foliage; *Daphne Cneorum*, with numerous pink flowers; and *Ledum groenlandicum*, a native of East Germany and suitable for wet slopes. *Rhododendron praecox* was also noticed, but this early-flowering shrub is usually spoilt by frost, as also happens in England. In other places there were large examples of *Magnolia Soulangeana nigra*, many ornamental conifers, and bamboo canes by the lake. At the period of the final session of the "Flora" the chestnut trees were in flower, while beneath their branches still lingered the pretty blue flowers of *Muscari botryoides*. In other suitable places were masses of *Erica carnea*, sedums of several kinds, *Viola cornuta*, and *Primula Wanda*.

Temporary buildings were erected for the accommodation of the more tender plants, and on each of the five sessions they were filled with flowers then in season. During the first day of the final session the queue of people seeking entrance to these buildings was maintained at about one thousand, and after taking one's place at the end of the queue it took just an hour to arrive at the first exhibit, which was a beautiful assemblage of irises and roses. The next group was composed of azaleas, shown by Felix & Dykhuis, of Boskoop, after which the eye was attracted by a fine display of large-flowering irises and cheiranthus. Particularly pleasing to the many visitors was Keesen's extensive group of *Hydrangea hortensis*, ranging in color from pink to blue, and with a background of well-flowered rhododendrons.

Van Meeuwen & Sons, of Heemstede, staged a fine lot of *Lilium regale* and *L. longifolium*, while Rijnveld & Sons, of Hillegom, arranged an exhibit of brilliantly colored tulips. An unexpected group of tall dahlias in bloom, with dwarf, white-flowering chrysanthemums in the foreground, was put up by Ballego & Sons, of Leiden. These plants had, of course, been

forced, but their appearance alongside of tulips caused the visitors to consider whether it was really springtime or fall. Other attractive groups were composed of gloxinias, spiraeas, primulas, hydrangeas, and carnations.

Finally, the firm of B. D. Yong, of Rijswick, deserves praise for its beautiful exhibit of orchids. It comprised well-flowered examples of *Dendrobium Phalaenopsis*, *Cypripedium Maudiae*, *Oncidium Marshallianum*, numerous Cymbidiums, Odontoglossums, and Odontiodas. Special mention must, however, be made of an unusually fine plant of *Cymbidium Devonianum*, and also of *Neomoorea irrorata*, with three many-flowered spikes, and probably the finest example of its kind that has yet been seen in Europe.

On Friday, May 10, the "Flora" was attended by a party of about 150 visitors from various parts of the United States, and also by the European Representative of the Missouri Botanical Garden. The opening ceremony was therefore appropriately performed by Mr. Grenville T. Emmet, the American Minister at The Hague, and a beautiful tulip was formally named "Eleanor Roosevelt." Earlier in the day the American visitors were officially welcomed by the Burgemeester of Heemstede at the ancient town hall, while at midday they were invited to lunch at the "Flora" restaurant, and later to a non-official dinner and a view of the illuminations. Many members of the party took advantage of the invitation to visit the historic St. Bavo Cathedral, built towards the end of the fifteenth century, and to hear a specially arranged recital on the world-famous organ. The Cathedral also contains interesting models of old warships.

The American party also availed themselves of the invitation to visit, without entrance fee, the Frans Hals Museum, where are preserved some of the masterpieces executed by this famous painter in the early part of the seventeenth century. Interesting information concerning the pictures, the manner in which they had been cleaned and preserved, was kindly given in English by the Director, Mr. G. D. Gratama, when conducting the party through the various rooms.

In the central hall of the Frans Hals Museum was displayed a truly remarkable collection of documents, catalogues, and

books relating to the early history of the tulip and other bulbs. More than 300 items of this kind have been got together, mainly through the exertions of Mr. E. H. Krelage, of Haarlem, and it is gratifying to mention the interest which has been taken in these records by the large number of people who have visited the town. Soon after the year 1600 collecting and cultivating tulips became a fashion, and in the following years speculation grew to such an extent that lands and houses, diamonds and pearls, as well as other valuables, were freely exchanged for a single bulb of a distinct variety. In several instances speculation took place in bulbs that did not even exist, and as many people were thereby ruined, the tulip mania was suppressed by the Government in 1637. The writer of these notes has in his possession a prized catalogue of tulips that was printed at Haarlem in 1637, and in which, to give but one example, the variety "Vice Roy" is quoted at 6,700 guilders ($112) for a single bulb.

G. W.

DEDICATION OF COMMEMORATIVE MARKERS ALONG THE HENRY SHAW GARDENWAY, MAY 30, 1935

On May 30 five large metal commemorative tablets were unveiled at points of special significance along the Henry Shaw Gardenway which extends on U. S. Highway 66 from the city limits of St. Louis to the Arboretum of the Missouri Botanical Garden at Gray Summit, Mo. Incorporated in each marker is a bas-relief of Henry Shaw, founder of the Garden, the original of which was executed by Victor Holm. Members and guests of the Henry Shaw Gardenway Association, under whose auspices the dedication was held, proceeded from the Garden in St. Louis to the five points listed below at which the indicated dedications took place:

St. Louis City Limits Marker, dedicated by Mr. B. C. Stevens, Vice-Chairman St. Louis County Planning Association.

Buder Park Marker, near Eureka, dedicated by Mr. Hermann Schwarz, Vice-President the Henry Shaw Gardenway Association.

Major General Sterling Price Marker, east of Pacific, dedicated by Mrs. C. P. Wood, President Sterling Price Chapter United Daughters of the Confederacy.

Sandstone Bluffs Marker, Pacific, dedicated by Dr. H. A. Buehler, State Geologist of Missouri.

Missouri Botanical Garden Arboretum Marker, dedicated by Judge George C. Hitchcock, President of the Board of Trustees of the Missouri Botanical Garden.

After the dedication of the fifth marker, the company proceeded to the greenhouses of the Garden Arboretum, where the display of orchids was viewed and where a meeting of the Association was held. Mr. L. P. Jensen, President, presided, and the following were called upon for remarks:

Dr. George T. Moore, Director of the Missouri Botanical Garden; Mr. David P. Wohl, donor of four of the markers; Mr. Scott Wilson, Chairman Missouri State Board of Highway Commissioners; Mr. Victor Holm, School of Fine Arts, Washington University, sculptor of the bust of Henry Shaw; Mr. Albert P. Greensfelder, President St. Louis County Planning Association; Mr. Paul D. Kelleter, District Forester, U. S. Department of Agriculture.

The Association is sponsoring a project for widening the right of way on the stretch of highway into a two-hundred-foot parkway, planted with trees, shrubs, and flowers.

NOTES

Dr. Hermann von Schrenk, Pathologist to the Garden, gave an address before the Engineering School of Washington University, May 14, on "Experiences of a Timber Engineer."

Mr. Ladislaus Cutak, in Charge of Succulents at the Garden, gave an illustrated lecture before the South Side Lions Club at Bevo Mill, May 16, on "Interesting Plants of the Desert."

Dr. Edgar Anderson, formerly connected with the Garden and for the past four years Arborist at the Arnold Arboretum, Harvard University, has been appointed Geneticist to the Garden and Professor of Botany in Washington University.

Mr. George H. Pring, Superintendent of the Garden, spoke at the U. S. Veterans' Hospital, No. 92, at Jefferson Barracks, under the auspices of the Société des 40 Hommes et 8 Chevaux, May 29, on "Orchid Exploration in Central and South America."

Mr. L. P. Jensen, Manager of the Garden Arboretum, Gray Summit, gave the address at the opening of the Southwest Missouri Flower and Garden Show, Springfield, Mo., May 20, and on May 21 served as judge of the exhibits and gave an illustrated talk on "Ornamental Planting."

Dr. George T. Moore, Director of the Garden, delivered the address at the graduating exercises of the St. Louis City Hospital Training School for Nurses, at the Lafayette Park Methodist Church, May 14, and on May 27 spoke before the Garden Club of Columbia, Mo., on "Henry Shaw and His Garden."

Mr. Paul Allen, Garden Apprentice in the School for Gardening, who has just returned from a collecting trip to Panama, spoke on "Plant Exploration in Panama," before the following groups: Current Events Class of the Kirkwood High School, May 24; radio talk over Station KSD, May 31; Webster Groves Nature Study Society, June 10.

Among those visiting the Garden recently were Mr. Montague Free, Horticulturist, Brooklyn Botanic Garden, Brooklyn, New York; Dr. Harry J. Fuller, Instructor in Botany, University of Illinois; Dr. George J. Goodman, Instructor in Botany, University of Oklahoma; Dr. Harold St. John, Professor of Botany, University of Hawaii, Honolulu; Mrs. Everett F. Davis (Dr. Fanny Fern Smith), teacher of general science, St. Anne's School, Charlottesville, Virginia.

STATISTICAL INFORMATION FOR MAY, 1935

GARDEN ATTENDANCE:

Total number of visitors	30,348

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	32
Total number of books and pamphlets donated	273

PLANT ACCESSIONS:

Total number of plants donated	24
Total number of packets of seed donated	105

HERBARIUM ACCESSIONS:

By Purchase—	
Botanical Garden and Museum, Berlin-Dahlem, Germany —Plants of Ecuador, collected by H. J. F. Schimpff	237
Gentry, Howard Scott—Plants of Mexico	297
Lundell, C. L.—Plants of British Honduras	35
Weigel, Theodor Oswald—J. Weese, "Eumycetes selecti exsiccati," Fasc. XXIX, Nos. 701-725, inclusive	25
By Gift—	
Greenman, J. M.—Plants of Missouri	4
Locke, D. Roger—*Bumelia* from Texas	3
Moore, Clarence E.—Plants of Tennessee and Iowa	162
Shimek, B.—Plants of Iowa	57
Shoop, Cora—Plants of Missouri	1
von Schrenk, Hermann—*Aletris lutea* Small from Louisiana	1
Williams, Louis O.—Plants of Missouri	7
Woodson, R. E.—*Tradescantia* sp. from Missouri	1
By Exchange—	
Botanical Museum, University of Helsingfors, Helsingfors, Finland—"Plantae Finlandiae Exsiccatae," Nos. 1001-1300	300
Cornell University by W. C. Muencher—Plants of New Hampshire and New York	208
University of Missouri by Francis Drouet—Algae	3
Williams, Louis O.—Plants of Wyoming	149
By Transfer—	
Cutak, Ladislaus—Plants of horticulture	4
By Field Work—	
Allen, Paul H.—Plants of Panama and the Canal Zone collected by Paul H. Allen and A. A. Hunter	6,000±
Lodewyks, Maude C.—Plants of Missouri and Arkansas	253
Total	7,747

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until one-half hour after sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

THE GARDEN, 2315 TOWER GROVE AVENUE, ST. LOUIS, MISSOURI

GEORGE T. MOORE,
Director

KATHERINE H. LEIGH,
Assistant to the Director

HERMANN VON SCHRENK,
Pathologist

CARROLL W. DODGE,
Mycologist

JESSE M. GREENMAN,
Curator of Herbarium

ROBERT E. WOODSON, JR.,
Research Assistant

ERNEST S. REYNOLDS,
Physiologist

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AUGUST P. BEILMANN,
Aboriculturist

ARTHUR D. FORRESTER,
Plant Recorder

JOSEPH CUTAK,
In charge of Exotics

ALBERT PEARSON,
Painter

LADISLAUS CUTAK,
In charge of Succulents

THE ARBORETUM, GRAY SUMMIT, MISSOURI

LARS P. JENSEN,
Manager

ROY E. KISSECK,
Engineer

DAVID MILLER,
Orchid Grower

TROPICAL STATION, BALBOA, CANAL ZONE

REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.
Hove, Sussex, England

MISSOURI BOTANICAL GARDEN BULLETIN

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4

GROWING SUCCULENTS FROM SEED

1. Materials needed; 2. Seedlings appearing; 3. Seedlings ready for transplanting; 4. Kalanchoë seedlings ready for potting.

Missouri Botanical
Garden Bulletin

Vol. XXIII SEPTEMBER, 1935 No. 7

CULTURE OF SUCCULENTS IN THE MIDWEST

Although there is an increasing interest in succulents throughout the Middle West, no satisfactory work on their culture in this region has been published, and this article has been compiled from the writer's notes and observations in the hope that it will aid those attempting to grow these interesting plants. In its early days the Garden possessed the finest and most important collection of succulents in this country. Now two plant houses are devoted to their display, and thousands of visitors find great interest in the diversity and grotesqueness of their forms.

Before going any further, it might be well to explain the term "succulents." It is generally applied to those plants possessing fleshy or thickened leaves and stalks, and that are structurally adapted to live for prolonged periods without water. Under this group several thousand plants are listed belonging to various plant families, chiefly the Cactaceae, Crassulaceae, Euphorbiaceae, Amaryllidaceae, Liliaceae, Aizoaceae, and Portulacaceae. The cacti (Cactaceae) were originally confined to the New World, but have become naturalized in other countries, in many instances crowding out the indigenous plants. The spurges (Euphorbiaceae) are worldwide, but the succulent varieties are mostly native to South Africa, Madagascar, and the East Indies. The orpines (Crassulaceae), to which the sedums belong, are likewise distributed throughout the world, in both temperate and tropical climates. The century plants (Amaryllidaceae) are natives of America,

but the aloes (Liliaceae), which they somewhat resemble, are of African origin.

Cacti were among the first succulents to be cultivated. Soon after the discovery of America specimens of these picturesque plants were brought back to Europe by the early expeditions, and their popularity spread throughout continental Europe. Cactus fanciers vied with each other in securing the rarest plants, sparing no expense, and it is said that a certain horticultural enthusiast paid as much as 1000 francs for one of the smaller cacti. In America interest in desert plants seems to wax and wane, the present rage having begun in 1929. That their popularity is great and will persist for some time is evidenced by the numerous succulent societies which have recently been formed and the number of publications on the subject.

GROWING SUCCULENTS FROM SEED

One of the most fascinating phases of the culture of plants is growing them from seed, and this is especially true of succulents. Of course, great patience is required for this work, but the plants raised from seed are much healthier and better-appearing than the mature plants taken from the desert which are forced to adapt themselves to unnatural surroundings. Then, too, the wanton despoilation of our deserts by the self-styled "collectors," has made it necessary to adopt measures restricting collecting of the desert flora. Quarantine and other Federal restrictions also make it difficult to secure certain plants from their native homes. Apparently there is no alternative but to grow the succulents from seed.

Even the average flat dweller can grow a good number of seedlings in his home. All the equipment needed is a flower container, a piece of glass for cover, a saucer underneath to hold water, some good drainable soil, and a package of fresh seed (pl. 19, fig. 1). Seeds of various succulents are now readily obtainable from dealers in this country and abroad, at very moderate prices. Fresh, thoroughly matured seed is of the utmost importance for good and quick germination, and only reliable seed firms should be patronized. If a large quantity

of seed is available, it may be planted at different times. The writer has found that the spring months are best for seed planting, although any month of the year will bring fairly good results provided a temperature of 70° F. and above is maintained. In the Midwest seedlings will be more apt to "damp-off" in the winter than in spring and summer. As a container a seed pan is generally used, but for small plantings the ordinary porous four-inch pot is preferable. Care should be taken that it be clean, as a dirty pot might contaminate the young seedlings. Necessary drainage can be provided by a generous use of broken pottery or coarse gravel in the bottom of the container. On top of this sift porous soil made up of equal parts of garden loam, well-decomposed leaf mold, and sand, to within an inch of the rim, and press the soil down lightly.

Since the seed of most succulents is very small, care should be taken that the soil cover be no deeper than the size of the seed itself. The tiny seeds may be scattered lightly over the soil, but the larger ones should be sown evenly in rows. (Seeds of the prickly pears, Opuntias, which are quite large and have a hard outer coat, should be rubbed between two pieces of sandpaper to facilitate quicker germination.) Next, fill saucer with water and place the seed pan in it. As soon as the surface of the soil shows moisture, empty the water from the saucer, press the soil down again (though very lightly), and scatter a thin layer of fine gravel on top. This last is important, as it helps in retaining moisture and likewise in supporting the tiny seedlings. Finally, place glass cover over the top, and set the pot in a well-lighted window. At this stage and even after germination never permit the seed pan to dry out, and ventilate occasionally by removing glass cover. Some varieties will develop rapidly while others may take a long time. However, if after three months no seedlings have made their appearance, it is advisable to dump the pot and try again. Generally tiny little seedlings begin to push their way up through the gravel in seven to fourteen days (pl. 19, fig. 2). At the Garden, the writer has tested many seeds of various succulents, over a period of years, and the average time of germination is listed below.

AMARYLLIDACEAE

Agave brachystachys	18 days
Agave chiapensis	27 days
Agave chloracantha	42 days
Agave densiflora	10 days
Agave elongata	18 days
Agave Ghiesbrechtii	22 days
Agave Henriquesii	18 days
Agave horrida	8 days
Agave schidigera	12 days
Agave Victoriae-Reginae	20 days

ASCLEPIADACEAE

Duvalia Corderoyi	11 days
Duvalia elegans	10 days
Piaranthus comptus	14 days
Stapelia conformis	7 days
Stapelia Desmetiana	6 days
Stapelia flavirostris	11 days
Stapelia hirsuta	10 days
Stapelia pulchella	10 days
Stapelia verrucosa	10 days
Trichocaulon meloforme	7 days

CACTACEAE

Cactus intortus	40 days
Cephalocereus Palmeri	18 days
Cephalocereus senilis	20 days
Dendrocereus nudiflorus	33 days
Echinocereus Reichenbachii	50 days
Echinopsis valida	14 days
Hamatocactus setispinus	27 days
Harrisia Martinii	14 days
Myrtillocactus geometrizans	40 days
Neobesseya missouriensis	15 days
Neomammillaria elongata	22 days
Opuntia imbricata	22 days
Oreocereus celsianus	38 days
Selenicereus urbanianus	18 days
Trichocereus macrogonus	21 days
Trichocereus Spachianus	14 days

CRASSULACEAE

Crassula argyrophylla	48 days
Crassula columnaris	11 days
Crassula rosularis	18 days
Cotyledon orbiculata	17 days
Echeveria edulis	11 days
Greenovia aurea	10 days

Kalanchoë Blossfeldiana ..... 22 days
Kalanchoë carnea ..... 13 days
Kalanchoë Dyeri ..... 17 days
Kalanchoë flammea ..... 11 days
Kalanchoë rotundifolia ..... 15 days
Kalanchoë thyrsiflora ..... 14 days
Kalanchoë velutina ..... 22 days
Umbilicus pendulinus ..... 27 days

EUPHORBIACEAE

Euphorbia abyssinica ..... 11 days
Euphorbia antiquorum ..... 7 days
Euphorbia Barnhartii ..... 15 days
Euphorbia biglandulosa ..... 18 days
Euphorbia Bivonae ..... 8 days
Euphorbia caducifolia ..... 15 days
Euphorbia conspicua ..... 11 days
Euphorbia dendroides ..... 6 days
Euphorbia ingens ..... 23 days
Euphorbia mauretanica ..... 31 days
Euphorbia Nivulia ..... 7 days
Euphorbia Rothiana ..... 23 days

LILIACEAE

Aloe africana ..... 15 days
Aloe arborescens ..... 39 days
Aloe aristata ..... 39 days
Aloe Bortiana ..... 11 days
Aloe caesia ..... 11 days
Aloe greatheadii ..... 12 days
Aloe latifolia ..... 39 days
Aloe striata ..... 11 days
Aloe supralaevis ..... 15 days
Apicra congesta ..... 14 days
Apicra foliolosa ..... 11 days
Gasteria nitida ..... 31 days
Gasteria trigona ..... 20 days
Gasteria subverrucosa ..... 20 days
Haworthia arachnoidea ..... 14 days
Haworthia asperula ..... 31 days
Haworthia attenuata ..... 14 days
Haworthia Bolusii ..... 20 days
Haworthia Cooperi ..... 14 days
Haworthia cymbiformis ..... 14 days
Haworthia fasciata ..... 14 days
Haworthia pilifera ..... 31 days
Haworthia Radula ..... 10 days
Haworthia translucens ..... 27 days
Haworthia tortuosa ..... 27 days
Yucca baccata ..... 11 days

Yucca Baileyi ..... 9 days
Yucca elata ..... 41 days

AIZOACEAE (MESEMBRYANTHEMA)

Acrodon bellidiflorus ..... 10 days
Aethephyllum pinnatifidum ..... 10 days
Argyroderma Schlechteri ..... 8 days
Argyroderma testiculare ..... 7 days
Aridaria resurgens ..... 14 days
Aridaria splendens ..... 5 days
Astridia velutina ..... 8 days
Bergeranthus multiceps ..... 10 days
Bergeranthus scapiger ..... 10 days
Braunsia edentula ..... 10 days
Carpobrotus aequilaterus ..... 10 days
Chasmatophyllum musculinum ..... 10 days
Cheiridopsis cigarettifera ..... 9 days
Conophytum bilobum ..... 9 days
Corpuscularia Taylorii ..... 8 days
Cylindrophyllum calamiforme ..... 8 days
Dactylopsis digitata ..... 33 days
Delosperma Brunnthaleri ..... 11 days
Disphyma crassulina ..... 9 days
Dorotheanthus gramineus ..... 11 days
Drosanthemum brevifolium ..... 7 days
Erepsia heteropetala ..... 14 days
Erepsia inclaudens ..... 17 days
Faucaria felina ..... 17 days
Faucaria lupina ..... 17 days
Fenestraria rhopalophylla ..... 10 days
Gibbaeum pubescens ..... 10 days
Glottiphyllum linguiforme ..... 11 days
Glottiphyllum Salmii ..... 11 days
Hymenocyclus croceus ..... 9 days
Juttadinteria Simpsonii ..... 9 days
Leipoldtia Britteniana ..... 10 days
Lithops Lesliei ..... 9 days
Mentocalyx velutina ..... 8 days
Mesembryanthemum amoenum ..... 9 days
Mesembryanthemum aurantiacum ..... 30 days
Mesembryanthemum Brownii ..... 9 days
Mesembryanthemum coccineum ..... 19 days
Mesembryanthemum Haworthii ..... 32 days
Monilaria moniliformis ..... 8 days
Nelia Meyeri ..... 22 days
Oscularia caulescens ..... 68 days
Oscularia deltoides ..... 33 days
Pleiospilos Bolusii ..... 45 days
Psammophora longifolia ..... 15 days
Rimaria Heathii ..... 9 days

Sceletium anatomicum	10 days
Sceletium concavum	18 days
Semmanthe lacera	27 days
Titanopsis calcarea	9 days
Trichocyclus ciliatus	15 days
Trichodiadema stelligerum	9 days

After seeds have germinated the glass cover should be removed and replaced by a piece of white tissue paper to shield the plantlets from the direct rays of the sun. Under ordinary house conditions, watering will be required every fourth to seventh day. As the tiny seedlings develop, give more light gradually. It will not be necessary to transplant for a long time, unless the seedlings become crowded and danger of damping-off is imminent (pl. 19, fig. 3). In transplanting the same mixture of soil can be used as for the seeds. Transplant into flats, larger seed pans, or individual 1½-inch pots, gradually shifting into larger containers as the plants require and always allowing plenty of room (pl. 19, fig. 4). It is not necessary to repot cactus very often; usually if kept in small pots the danger of overwatering will be avoided.

OTHER METHODS OF PROPAGATION

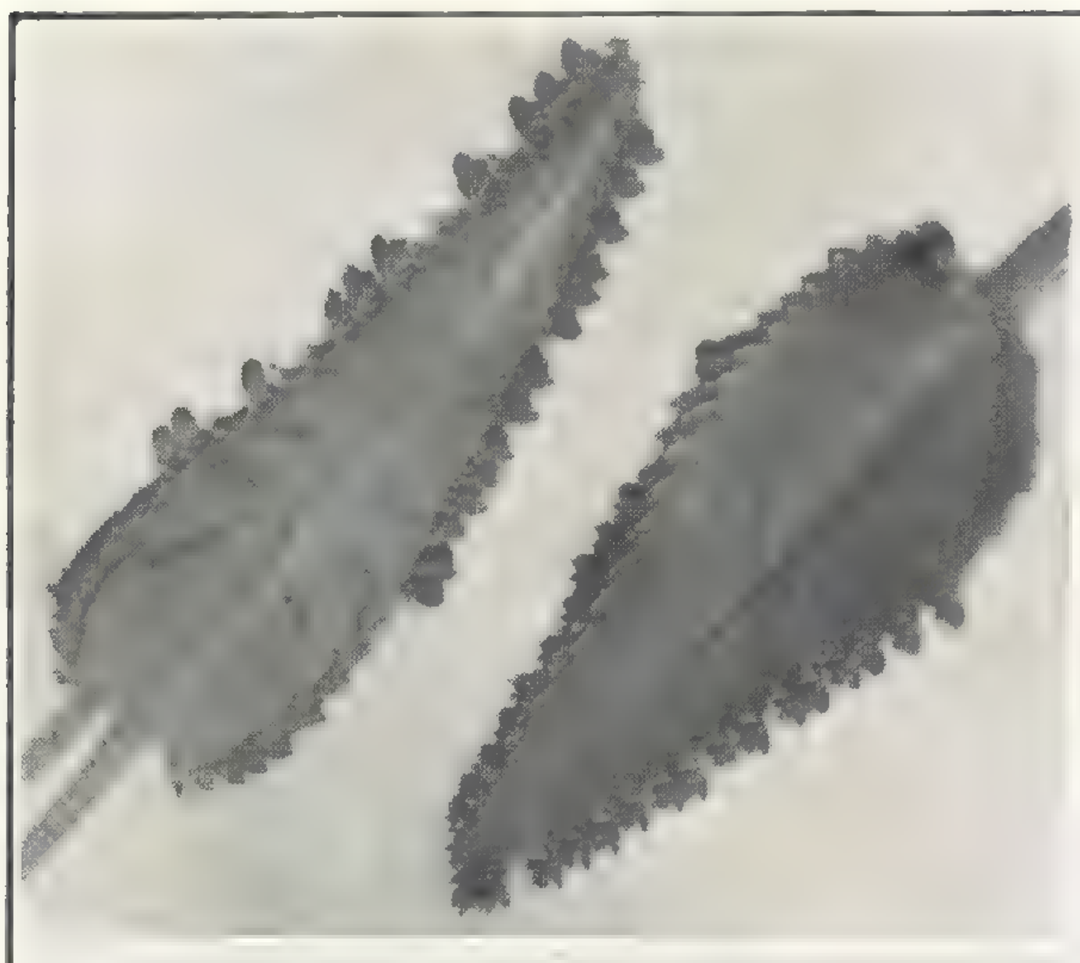
In addition to propagation by seed, most of the succulents can be multiplied vegetatively, i. e., by cuttings, by division of large clumps, by offsets, by leaves, or by grafting. By this method plants will attain maturity in a shorter time than when grown from seed. Almost any portion of the stem can generally be cut off, treated, and forced to produce new growth. All cuttings with a large cut surface, such as cacti and spurges, must be placed in a dry atmosphere for a few days in order to form a callus over the wounded section. This is important, for unless the cuticle is healed the cut surface would be subject to bacterial rot, which would quickly destroy the cutting. Succulents with small exposed surfaces, such as the hen-and-chicken plants (Echeveria), form a protective tissue in a few hours. Although most cuttings can be placed directly in a mixture of sand and soil, pure sand seems to be a better rooting medium. Some plants will produce a vigorous root system in a week. New shoots along the stem are a good indication that

the cutting is forming roots. Water should be applied very sparingly or not at all until some sign of growth appears. Cuttings of tender succulents, such as the mesembryanthemums, must be shielded from the direct rays of the sun and their exposed parts lightly sprinkled to keep them from wilting.

Many plants, as, for instance, the Opuntias (prickly pears), the Kalanchoës, and Bryophyllums, are naturally adapted to vegetative propagation. The stems and fruits of most prickly pears break off very easily and fall to the ground, where in a short time they throw out roots and develop independently as new plants. So strong is the principle of life in many succulent plants that they very often produce numerous tiny plantlets all along their stems or on the margins of the leaves. A good example of the former is Echinopsis, South American plants of the cactus family, with long trumpet-like flowers which open toward evening. Some of them, as *E. Eyriesii*, produce numerous offsets, either at the bottom or top of the old plant, which readily become detached from the mother plant and strike root in the surrounding soil. The writer has one such specimen completely covered with these tiny plants. The Bryophyllums are a good example of leaf propagation. Their name, meaning "life plants," was given on account of the numerous plantlets which are produced along the margins of the leaves (pl. 20, fig. 1). These also detach themselves easily, cluttering the soil around the mother plant and growing independently. Most of the crassulaceous plants, such as the Sedums, Echeverias, Crassulas, Kalanchoës, and Bryophyllums, can be readily propagated by leaf cuttings. Simply take off a leaf, place it in sand or on top of the soil, keep somewhat moist, and the baby plants will appear (pl. 20, fig. 2). Later these can be potted as seedlings.

GRAFTING

Grafting of succulents, especially cacti, is a very simple and interesting process resorted to for a variety of purposes, chiefly the following. To preserve certain species that through decay might be lost; to raise certain species that are very difficult



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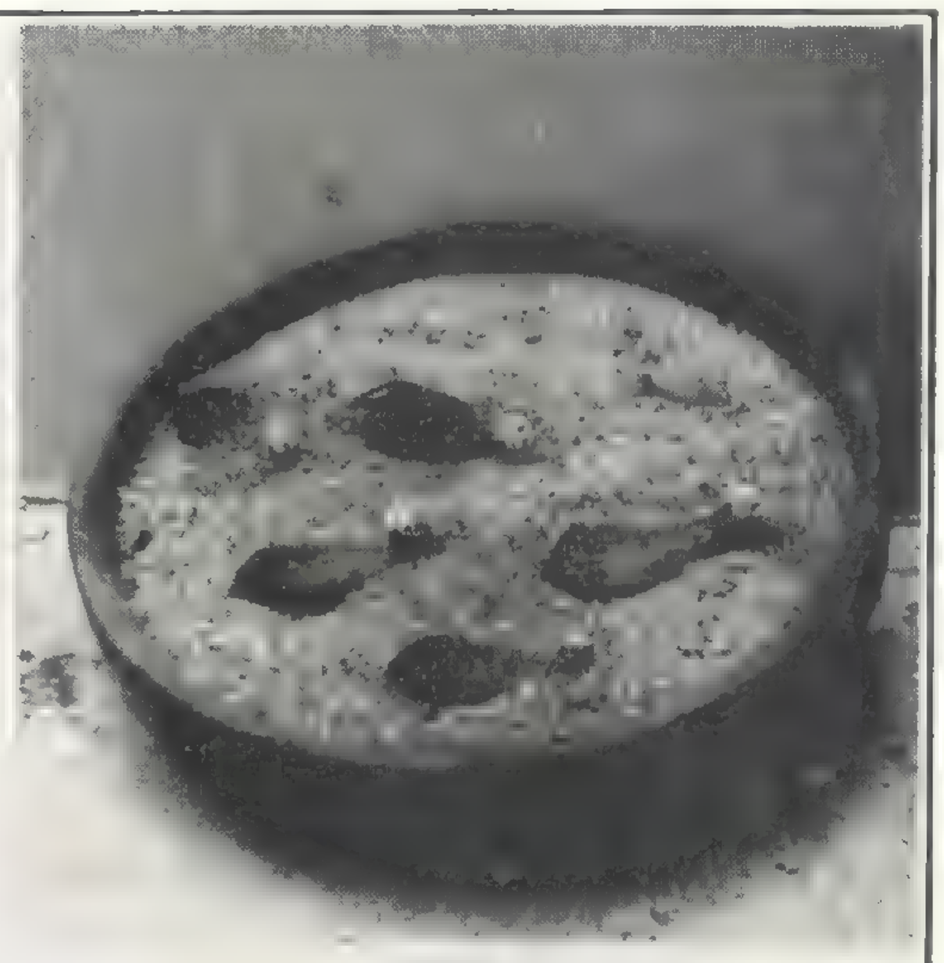

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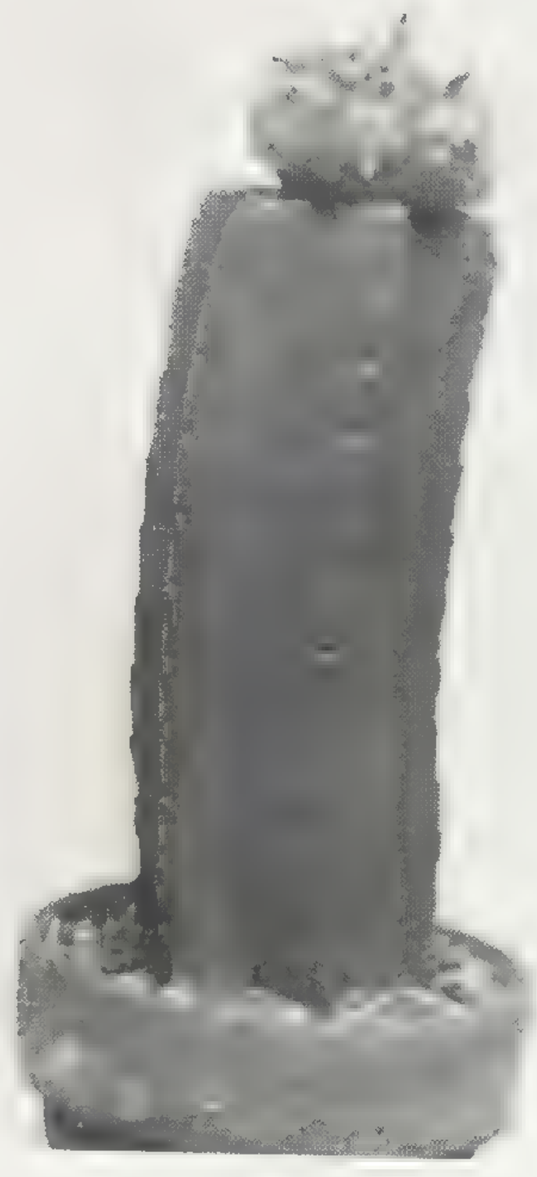

4

PROPAGATION OF SUCCULENTS

1. Bryophyllum plantlets produced on the margins of leaves; 2. Leaves of Echeveria producing young plants; 3. *Aporocactus flagelliformis* cleft-grafted on *Hylocereus undatus*; 4. Flat graft of *Lophophora Williamsii* on *Cereus peruvianus*.

1

2

3

SUCCULENTS IN THE HOME

1. A kitchen-window garden; 2. Rectangular desert garden; 3. Miniature desert gardens.

to grow on their own root; to produce quicker growth; to insure a greater number of flowers; to develop bushy and more decorative plants or unusual novelties. Grafting is really

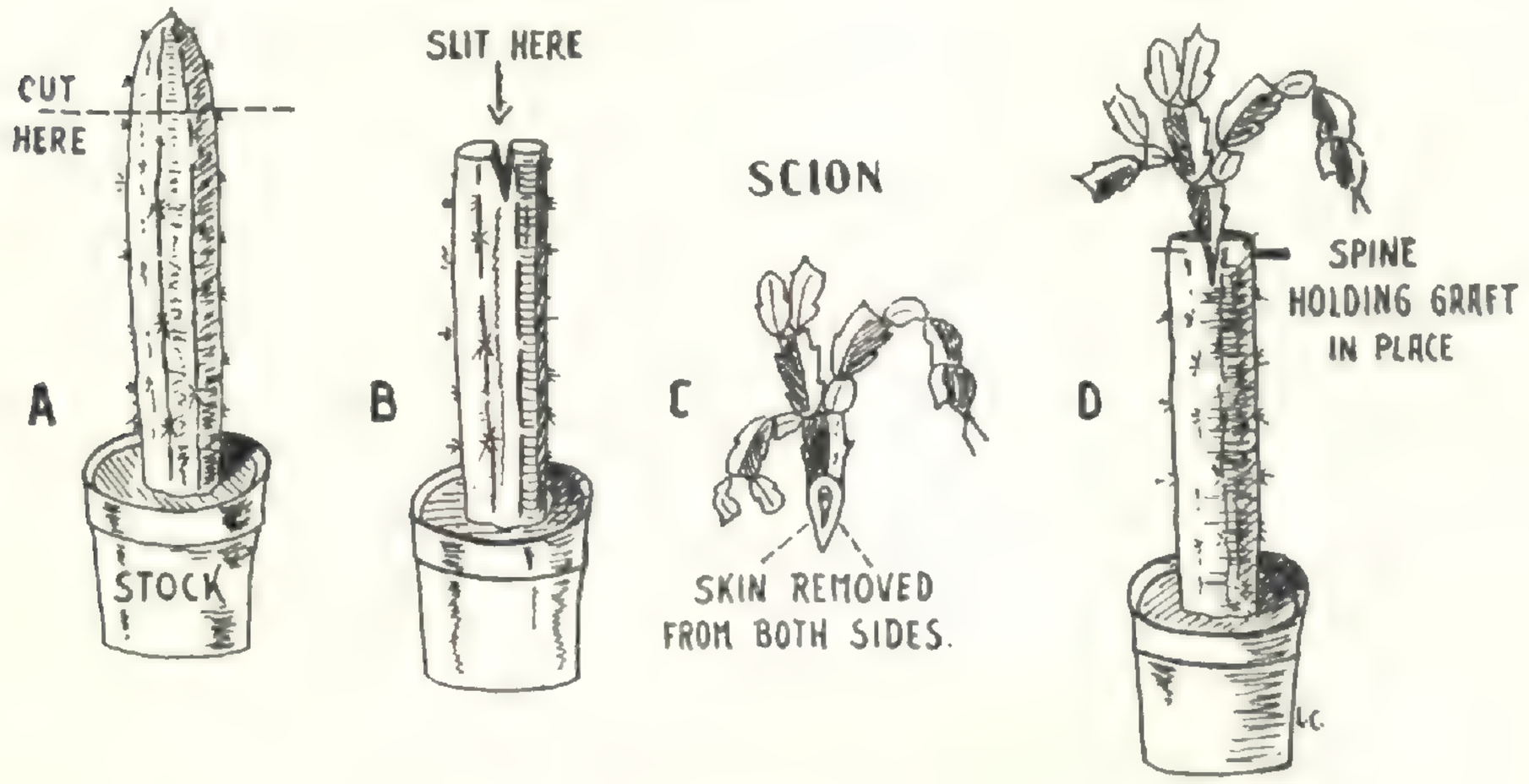

Fig. 1. Illustrating the cleft graft.

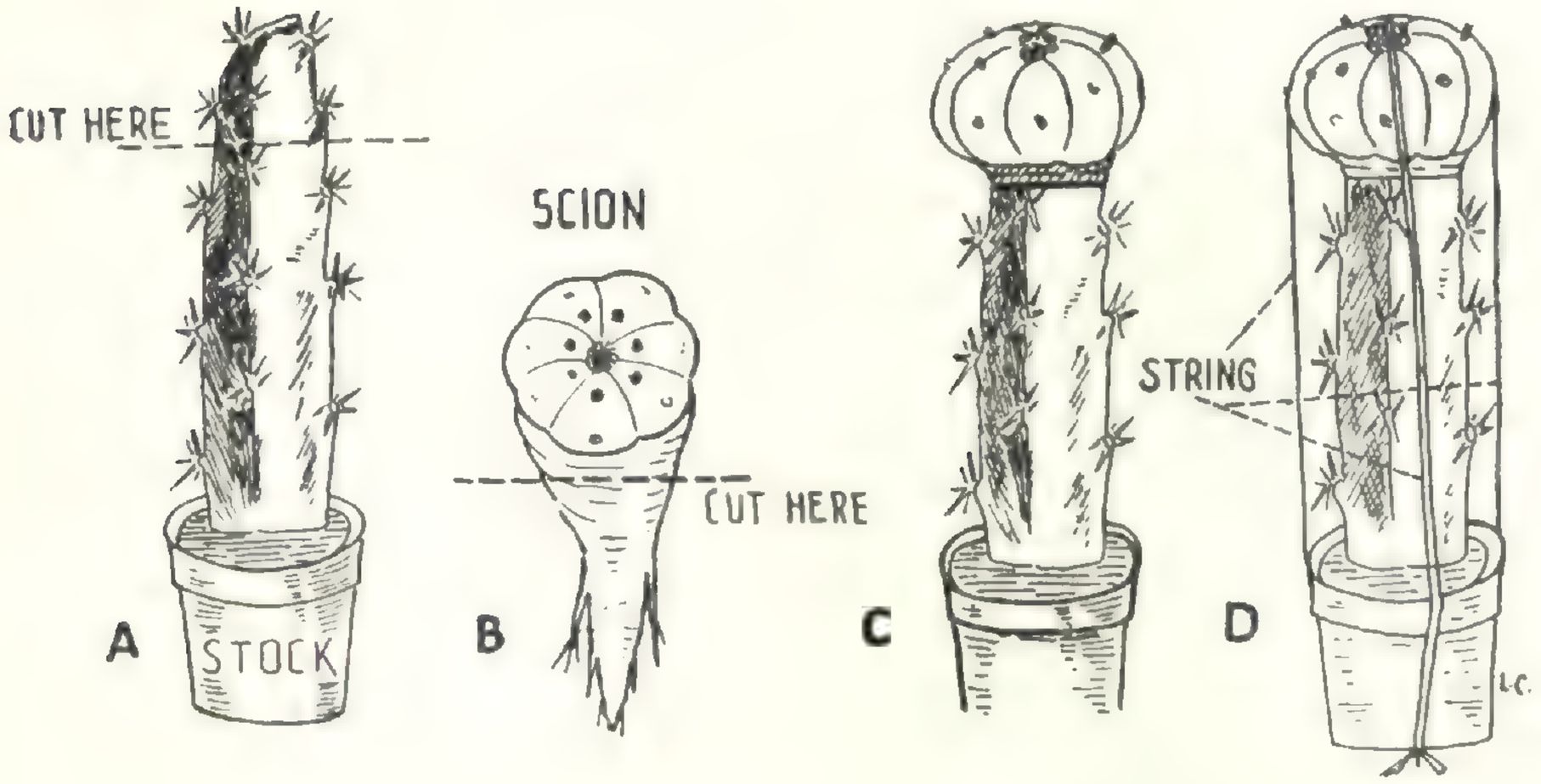

Fig. 2. Illustrating the flat graft.

nothing more than the union of two separate plants growing as one. The two plants used in grafting are known as the stock and the scion. The stock is the plant with the roots

which supplies the nourishment to the scion, and the scion is the plant that is inserted on the stock. Almost any of the large-growing species of Cereus can be utilized as stock for the smaller-growing Opuntias, the delicate-spined pincushion cacti (Mammillaria), and the pendulous, epiphytic Rhipsalis. It is generally advisable to have stock at least six to twelve inches high, otherwise a stake will be needed for support. Grafting should be done in the hot season and care should be taken that the two plants to be used in the operation are in a healthy condition. There are two chief kinds of grafts, the cleft and the flat. Cleft graft is desirable for all thin-stemmed plants, such as the Christmas cactus, rhipsalis, and rat-tail cactus (pl. 20, fig. 3). For the thick and globose types, as Echinocactus, Echinopsis, and Mammillaria, the flat graft is used (pl. 20, fig. 4). Directions for cleft grafting are simple. A sharp clean knife should be used (some prefer razor blades). After selecting the two plants, as, for instance, the night-blooming cereus (Selenicereus) for stock and the Christmas cactus (*Zygocactus truncatus*) for scion, cut stock to a desired height, and make a slit at the top about an inch long. Then cut the stem of the scion on each side to form a wedge and insert into the slit of the stock. Place in a warm, somewhat moist location, and be careful not to get any water on the cut surface. A two- to three-jointed Christmas cactus grafted on a night-blooming cereus grows amazingly fast and in two years should produce a wonderful head. When using the flat graft, the scion and stock should be of about the same diameter. Both plants should be cut with smooth transverse cuts and the two flat surfaces pressed firmly together and held in place by raffia or woolen threads, as shown in the accompanying diagrams.

SEASONAL CARE

To say that succulents, especially the cacti, need no attention, is a fallacy. Even among cactus plants different cultural methods must be applied. The greater majority are found growing under the hottest sun and in the poorest soil where the rainfall is very scanty; and yet even under such conditions

the plants prosper and flower freely, for they have developed the ability to take up and store within their bodies the moisture which at intervals comes their way. The barrel cacti, the fish-hooks, the pincushions, the hedgehogs, and wicked chollas are but a few belonging to this class. They are generally very spiny, the spiny armament acting as a shield from the scorching rays of the sun. Plants of this type are very desirable for home culture (pl. 21, fig. 1), as they are able to withstand the hot, dry atmosphere of our living rooms. The Christmas cactus, the broadleafs, rhipsalis, the rat-tails, and the trailing night-blooming cerei, are mostly epiphytic, growing with the orchids and bromeliads upon the trunks and branches of trees in tropical America. They require a richer soil (but very porous) and humid surroundings, and can be grown successfully in any ordinary sun-room.

Cacti from the hot deserts, as the barrel cacti, must be watered very moderately during the winter months, only at 3- to 4-week intervals and then only on clear, sunny days, The best way to water plants in the winter is to place them in a large vessel and allow the water to come up from below, moistening the roots only. The Christmas cactus and similar varieties must never be allowed to get very dry, although a short rest period in September to October and again after flowering is recommended. Other succulents, such as the Mesembryanthemums, need more water than a cactus. However, it must be remembered that good drainage is necessary at all times, as very few succulents will survive if their "feet" are constantly wet.

All succulents should be given a period of rest for three or four months during the winter, when they should be placed in a cooler room and watered more sparingly. If kept growing all the year around, no buds or very few will appear. Winter months as a rule are the danger months for succulent plants, but if proper attention is given to temperature, water, etc., no difficulty should be experienced. All plants that have been planted outdoors during the summer months must be brought indoors about the first of October. Many cactus plants that

are whipped by bitter winds and covered under a blanket of snow in the mountainous regions of the Southwest cannot endure the winters of the Middle West. It isn't the cold that plays havoc, but the excessive dampness combined with cold. A few years ago many department stores in the Midwest were advertising the "Flame Ball" (Ferocactus) as a hardy species for our rock gardens, but every plant that was left outdoors died. Sunlight is an important factor in the life of a plant, and in order to obtain all that is possible in the winter the plants should be placed in window recesses or near windows. Without light plants will grow stringy, weak, and sickly, and often this condition will lead to their death.

On clear warm days, during the month of March, all succulents should be taken outdoors but must be brought in before evening. During April they can be left on the porch, but careful watch must be kept for frosts. By keeping the plants outside for part of the time, they are prepared to withstand the intense sunlight and warmth later. Usually, during May, plants can be set out permanently, either in rockeries, beds, or in borders. Because of the heavy spring rains in our Middle West, cacti and other succulents should be planted on a slope so that excess water will readily drain off. The writer does not recommend planting cacti directly in the ground, but rather plunging them with their pots to within an inch of the rim and covering the surface with gravel, limestone chats, or other small rocks. Although plants will do better if planted directly in the soil, the average worker will not have the time to dig them up carefully and repot them in the fall. It should be remembered that succulents, in order to ripen their stems, need all the sun possible during the fall months and they should be left outdoors until there is danger of frost. A light frost will not bother the hardier types, and they usually may continue outside until about the end of October in the St. Louis area. October 1 should be used as the deadline for the tender kinds, but if a warm spell occurs at that time (as it often does) the plants may be left out for another week or two but a careful watch of the weather must be kept. Succulents exposed to

the sunshine, the air, and rain during the summer months will do far better than those kept indoors and given home treatment.

GLASS-ENCLOSED DESERTS

A few years ago, glass gardens or Wardian cases were the rage, and many artistic woodland and jungle gardens were created in various types of glass containers. The woods and country side were scoured for tiny plantlets, while florists and nurserymen were besieged for the highly colored tropical plants to be used in the miniature jungle gardens. Somehow the use of succulent plants was generally overlooked, but the writer has found that cacti and other fleshy-leaved plants lend themselves admirably to this mode of culture. It is surprising what a fine collection of tiny desert plants can be grown in just such a manner.

There is a great variety of glass containers from which to choose, but the most satisfactory are the 1–2-gallon drum-shaped aquaria and the 5-gallon (or more) rectangular aquaria (pl. 21, figs. 2 and 3). Select only those with clear glass free from flaws, since poor glass will produce distorted images of the plants within. For drainage, which is very important for succulent plants, gravel or sand must be supplied to the thickness of one inch at the bottom of the container. A few pieces of charcoal are then added, and finally two to three inches of porous soil. Care should be exercised to use only small plants, from two to three inches high, and never to crowd them as in woodland or jungle miniatures. After planting, the surface of the soil should be covered with sand or fine gravel and moistened lightly. Once a desert garden is planted and placed in a well-lighted position, no care will be necessary for a long time. Leave an inch of space between the glass cover and the opening, so that air will have free access at all times. An occasional "sweat" produced by closing the opening will prove beneficial, but if the soil seems to be saturated leave lid off until it dries out. The soil will seldom dry out completely, but if it does, water by hand. Experiments conducted by the writer at the Garden, over a period of years, show that the cacti are more

suitable for growing in glass enclosures than the tender fleshy-leaved succulents. Glass gardens planted three years ago with cacti alone are still thriving, whereas the plants had to be replaced in those planted with Mesembryanthemums, Crassulas, Aloes, etc.

L. C.

NOTES

Dr. Edgar Anderson, Geneticist to the Garden, has been elected president of the Herb Society of America.

Mr. L. P. Jensen, Manager Missouri Botanical Garden Arboretum, has been reelected president of the Garden Club of Gray Summit, Mo.

Mr. L. P. Jensen attended the meeting of the Citizens Road Association of Missouri at the State Fair, Sedalia, Mo., August 5.

Dr. George T. Moore, Director of the Garden, addressed the Garden Club of Dublin, N. H., August 20, showing some moving picture films of plant life.

Mr. A. P. Beilmann, Arboriculturist to the Garden, gave an address before the National Shade Tree Conference, Philadelphia, August 28, on "The Use of Instruments in Tree Diagnosis."

Mr. G. H. Pring, Superintendent of the Garden, spoke before the Rotary Club of Alton, Ill., July 31, on "Orchid Hunting in Central and South America"; and before the Webster Groves Home Garden Club, September 13, on "Evergreens."

Dr. George W. Martin, of the State University of Iowa, and Dr. Robert E. Woodson, Jr. and Mr. Russell J. Seibert, of the Missouri Botanical Garden and Washington University, have recently returned from the Republic of Panamá where they made general collections of Fungi, Ferns, and Spermatophytes in the Canal Zone and the Provinces of Panamá, Coclé, and Chiriquí. The party made their headquarters during the months of June, July, and August at the Tropical Station of the Missouri Botanical Garden, Balboa, C. Z.

Recent visitors to the Garden include Prof. E. C. Volz, professor of horticulture, Iowa State College, Ames; Dr. E. J. Murphy, of New York University; Miss Frances Miners, in Charge of Children's Gardens, Brooklyn Botanic Garden, Brooklyn, N. Y.; Dr. Ethel T. Eltinge, assistant professor of botany, Mt. Holyoke College, South Hadley, Mass.; Dr. Ward M. Sharp, assistant biologist, Division of Migratory Water Fowl, Bureau of Biological Survey, Valentine, Nebr.; Mr. H. McKeen Cattell, editor of *Science*, Garrison-on-Hudson, N. Y.; Miss Bonnie C. Templeton, of the Los Angeles Museum, Los Angeles, Calif.; Mr. C. H. Muller, botanical collector, and student at the University of Illinois, Urbana; Dr. Robert Stratton, assistant professor of botany and plant pathology, Oklahoma Agricultural and Mechanical College, Stillwater; Dr. C. L. Hitchcock, assistant professor of botany, University of Montana, Missoula; Dr. W. T. Penfound, assistant professor of botany, Tulane University, New Orleans, La.; Prof. Carl Skottsberg, Prefect, Botanical Garden, Göteborg, Sweden; Mr. Edward C. Vick, horticultural editor, New York *American*, Boston *Advertiser*, and Pittsburgh *Sun-Telegraph*.

STATISTICAL INFORMATION FOR JUNE-AUGUST, 1935

GARDEN ATTENDANCE:

Total number of visitors in June	27,357
Total number of visitors in July	24,444
Total number of visitors in August	31,085

PLANT ACCESSIONS:

Total number of plants and packets of seeds donated in June	77
Total number of plants and packets of seeds donated in July	26
Total number of packets of seeds donated in August	21

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought in June	25
Total number of books and pamphlets donated in June	115
Total number of books and pamphlets bought in July	30
Total number of books and pamphlets donated in July	75
Total number of books and pamphlets bought in August	5
Total number of books and pamphlets donated in August	3

HERBARIUM ACCESSIONS:

JUNE

By Purchase—
Aellen, P.—Plants of Europe..... 470
Erichsen, C. F. E.—"Lichenen insbesondere aus Schleswig-Holstein," Cent. I, Nos. 1-100, inclusive..... 100
Lundell, C. L.—Plants of British Honduras..... 55

By Gift—
Cutak, J.—*Bacopa rotundifolia* (Michx.) Wettst. 1
Featherly, H. I.—*Condalia lycioides* (Gray) Weberbauer, from Oklahoma 1
Gates, Frank C.—*Tradescantia* from Kansas..... 6
Royal Botanic Gardens, Kew—*Tetramerium* and *Henrya* from Mexico..... 9
Steyermark, J. A.—*Lepidium Draba* L., collected by Oscar Petersen, from Missouri..... 1

By Exchange—
Gray Herbarium, Harvard University—"Plantae Exsiccatae Grayanae," Cent. V, Nos. 401-500, inclusive.... 100
Gray Herbarium, Harvard University—Plants of Scandinavia 56
Gray Herbarium, Harvard University—Miscellaneous duplicates 66
New York Botanical Garden—Plants of Santo Domingo, collected by G. Proctor Cooper III..... 47
University of Montana by C. L. Hitchcock—Plants of Montana 100
University of Oklahoma by G. J. Goodman—Plants of Oklahoma and Texas..... 25

By Transfer—
Cutak, L.—Plants of horticulture..... 4
Fairburn, David C.—Plants of Horticulture..... 4
Moore, G. T.—*Spiraea bella* Sims from horticulture.... 3

Total 1,048

JULY

By Purchase—
Gleason, H. A.—Plants of Brazil, collected by Boris A. Krukoff 1,221

By Gift—
Barkley, F. A.—*Sabatia campestris* Nutt. from Oklahoma 1
Barkley, F. A. and Otto von der Au—Plants of Missouri 20
Bramsch, Helen—*Pinus* sp. from California..... 1
Charleston Museum, Charleston, South Carolina—Plants of South Carolina..... 3
Clark, O. M.—Plants of Mexico..... 500

Hume, H. H.—*Zephyranthes* from Florida..... 61
Kury, H.—Plants of Florida..... 31
McCart, W. L.—Plants of Texas..... 65
Stephens, J. L.—Plants of Georgia..... 7
University of Illinois by Harry J. Fuller—*Aegilops cylindrica* Host. from Illinois..... 1
Webster Groves Nature Study Society—Plants of Kansas and New Mexico..... 54
West, E.—Plants of Florida..... 15

By Exchange—
University of Michigan by C. L. Lundell—Plants of Mexico and Central America..... 144

By Transfer—
Cutak, L.—Plants of Horticulture..... 4

Total 2,128

AUGUST

By Purchase—
Porsild, Morten P.—Plants of Greenland..... 176

By Gift—
Beal, J. M.—*Allium* of Horticulture..... 5
Cornelius, Miss Ruth—*Acidanthera bicolor* Hochst. of Horticulture, collected by Albert Ulrich..... 1
Hills, Mrs. W. A.—Plants of Horticulture..... 2
Kellogg, John H.—*Isanthus brachiatus* (L.) BSP. from Missouri 1
Lodewyks, Maude C.—Plants of Missouri..... 120
Lynch, Mrs. J. T.—*Habenaria ciliaris* (L.) R. Br. from Arkansas 1
Prince, Mrs. E. Fred.—*Cystopteris fragilis* (L.) Bernh. from Missouri 1
Webster Groves Nature Study Society—*Tradescantia* sp. from New Mexico..... 1
Woodson, Dr. R. E., Jr.—Plants of Yucatan and Guatemala distributed by C. L. Lundell..... 4
Woodson, Dr. R. E., Jr.—Plants of New York, collected by H. H. Rusby..... 1
Lily M. Perry—*Tradescantia* sp. from Georgia..... 2

By Exchange
New York Botanical Garden—Plants mostly from Hainan, China..... 353

By Transfer—
Cutak, L.—Plants of Horticulture..... 1

Total 669

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

THE GARDEN, 2315 TOWER GROVE AVENUE, ST. LOUIS, MISSOURI

GEORGE T. MOORE,
Director

KATHERINE H. LEIGH,
Assistant to the Director

HERMANN VON SCHRENK,
Pathologist

EDGAR ANDERSON,
Geneticist

JESSE M. GREENMAN,
Curator of Herbarium

ROBERT E. WOODSON, JR.,
Research Assistant

ERNEST S. REYNOLDS,
Physiologist

DAVID C. FAIRBURN,
Research Assistant

CARROLL W. DODGE,
Mycologist

NELL C. HORNER,
Librarian and Editor of Publications

GEORGE H. PRING,
Superintendent

JOHN NOYES,
Consulting Landscape Architect

PAUL A. KOHL,
Floriculturist

WILLIAM F. LANGAN,
Chief Engineer

JOHN H. KELLOGG,
Plant Collector

JOSEPH LANGEN,
Assistant Engineer

AUGUST P. BEILMANN,
Aboriculturist

ARTHUR D. FORRESTER,
Plant Recorder

JOSEPH CUTAK,
In charge of Exotics

ALBERT PEARSON,
Painter

LADISLAUS CUTAK,
In charge of Succulents

THE ARBORETUM, GRAY SUMMIT, MISSOURI

LARS P. JENSEN,
Manager

ROY E. KISSECK,
Engineer

DAVID MILLER,
Orchid Grower

TROPICAL STATION, BALBOA, CANAL ZONE

REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.
Hove, Sussex, England

MISSOURI BOTANICAL GARDEN BULLETIN

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CERATOSTIGMA PLUMBAGINOIDES
(From "Botanical Magazine," pl. 4487.)

Missouri Botanical Garden Bulletin

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BRIGHTENING UP THE ROSE GARDEN IN LATE SUMMER

In many parts of the United States, but more particularly in the Middle West, even the most carefully tended rose gardens become somewhat of a problem by the first of August. Their earlier glory has then departed; the bloom and fragrance which made them the center of attraction in May and June have been succeeded by only an occasional flower. While such a garden may be full of interest to the true rosarian, to the average gardener it seems bare and uninteresting. The obvious solution of the problem would seem to be an interplanting of other plant material. Though often attempted this is not as easy as it sounds, for the rose is an aristocrat and does not combine readily with common garden flowers. Climbing roses may form a beautiful background for the perennial border, certain of the wild roses may brighten up the shrub collection, but roses by and large, a whole rose garden full of them, do not neighbor well with most annuals or perennials. As a result many Middle Western gardeners have despaired of having a presentable display during the entire season, and some have even planted their roses in a secluded corner where they might be enjoyed at their best and yet remain inconspicuous during the late summer.

For the past two seasons the Missouri Botanical Garden has successfully met the problem of the rose garden by planting a clipped hedge of germander, *Teucrium Chamaedrys*, around

the central bed. Its thrifty blue-green foliage has defied the hot weather and has given an illusion of freshness and abundance to the whole garden. Between the roses in the central bed, and at other points in the rose garden, the old reliable summer perennial, *Ceratostigma plumbaginoides*, has been interplanted (pl. 22). Its gentian-blue flowers have provided a lovely foil for such roses as were in flower and have combined attractively with the low Teucrium hedge. It has been useful as well as beautiful, since it shades the soil between the roses and serves as a summer mulch. As grown at the Garden the Ceratostigma[1] does not flower until well into July so that the garden during the rose season seems quite unchanged. As the roses begin to go, the green foliage of the Ceratostigmas becomes more and more conspicuous, and from the first of August until frost the soft deep blue of their flowers is the dominant note in the rose garden.

The combination of Teucrium hedges and an interplanting of Ceratostigma has one disadvantage. Several of the operations required to maintain these plants in excellent condition for season after season are more easily carried on at a large botanical garden than by the average home owner. The planting and maintenance of Teucrium hedges will be taken up in the following article. The management of Ceratostigma in the rose garden is a little more intricate than one might think who knew the plant only as a hardy member of the perennial border. Unfortunately, when left to itself it forms a thick mat which eventually dies out in spots and which prevents hilling up around the roses in the late fall. At the Garden the Ceratostigma is taken up and carried over the winter in cold-frames, the plants being divided and reset the following April. Managed in this way, the roses can be cared for during the winter precisely as they were before. The Ceratostigma, far from objecting to this treatment, positively thrives on it, producing thriftier looking plants than when left to fend for itself.

Any one with a lingering prejudice against the use of other

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[1] In many nursery catalogues, Ceratostigma will be found listed under the name of *Plumbago Larpentae*.

plant material in a large rose garden should have visited the Missouri Botanical Garden this September. The central bed, which forms a focal point for most of the main paths of the Lower Garden, was a sight long to be remembered. A low circlet of germander, dark green and quietly luxuriant, inclosed an unbroken sheet of dark blue, upon the surface of which were borne a few "Radiance" and "Catherine Zeimet" roses. In spite of the heat, the planting looked cool and the roses, germander, and Ceratostigma had the air of belonging together. E. A.

TEUCRIUM CHAMAEDRYS (GERMANDER)

Dwarf box has never been satisfactory as an edging plant for flower beds in the Middle West, and in the last few years germander *(Teucrium Chamaedrys)* has been suggested as a substitute for it. In 1931 the Missouri Botanical Garden secured a dozen plants of *Teucrium Chamaedrys* from an eastern grower, and from these plants a large stock has been propagated for use in various formal gardens. Plants from 2½-inch pots set out in the spring and spaced eight inches apart will produce a neat, compact hedge (pl. 23) in one season if the plants are sheared once or twice during the summer. Teucrium is not affected by any insects or diseases; it retains its small, glossy, green foliage until January when a few days of zero temperature will cause the leaves to shrivel and gradually drop off. In the spring the plants should be cut back, but the amount to cut away will depend upon the ultimate desired size of the hedge. In the second summer the hedge will readily attain a width and height of eighteen inches, but it may be kept much smaller by shearing. If only a small hedge is wanted it would be better to shear the plants close to the ground in the spring and later trim them to any desired height.

Teucrium is considered reliably hardy in this climate, but what would happen in a winter when California privet is frozen to the ground cannot be predicted. However, such winters occur rather infrequently, so that fact should not deter any one from

planting it. Until it has been proved that Teucrium can stand all temperature changes, a safe procedure would consist in inserting a stock of cuttings in flats or boxes and storing them in a cold-frame during the winter. Should a severe winter kill the hedge, fresh stock would then be available for replanting in the spring. Make the cutting about 2½ inches long, and remove from it all the lower leaves, but retain the ones on the upper third. If flats are used they should be filled with a mixture of half sand and half soil overlaid with a layer of pure sand. Tamp this soil and sand firmly and insert the cuttings one inch deep, spacing them ¾ of an inch apart in the row and the rows 1¼ inches apart. Water the flats and set them in a sheltered frame. Shade the cuttings for a few days and gradually admit more sunlight, and always shield them from drying winds. Cuttings may be made in the spring from the fresh growth when it is firm (early June) and again in late August and September, but they cannot be so successfully rooted during the hot months of July and August. If they are made in the fall and left in a frame during the winter they should be protected from severe frost, but light freezing will not injure them. A few dozen plants will yield all of the cuttings needed to edge the beds of any garden regardless of size.

Teucrium Chamaedrys is not a new plant, as its recent popularity might presuppose, but a very old plant which centuries ago was used for edging the "knots," particularly in the Elizabethan gardens. It has always been much prized in Europe as an herb. In searching through the old catalogues of two representative eastern horticultural firms we find that Farquahar of Boston first listed seeds of *Teucrium Chamaedrys* in 1912. In 1915 the first plants were offered for sale. In a blue-print on page 20 of *The Garden Magazine* (now *American Home*), February, 1915, Stephen F. Hamblin recommends the use of *Teucrium Chamaedrys*, or germander, as a plant to be used in a formal garden of fragrant herbs. *Breeze Hill News*, Vol. II, No. 2, October, 1932, illustrated and described the plant. This same Teucrium was described in *Horticulture* in the May 1, 1930, issue and again in May 15, 1934.

Chamædrys, Germander.

Left Germander should be vtterly forgotten, as not worthy of our Garden, seeing many (as I said in my treatise or introduction to this Garden) doe border knots therewith: let me at the least giue it a place, although the last, being more vsed as a strewing herbe for the house, then for any other vse. It is (I thinke) sufficiently knowne to haue many branches, with small and somewhat round endented leaues on them, and purplish gaping flowers: the rootes spreading far abroad, and rising vp againe in many places.

The Place.

These Hyssopes haue beene most of them noursed vp of long time in our English Gardens, but from whence their first originall should be, is not well knowne. The Germander also is onely in Gardens, and not wilde.

The Time.

They flower in Iune and Iuly.

The Names.

The seuerall names whereby they are knowne to vs, are set forth in their titles; and therefore I neede not here say more of them then onely this, that neyther they here set downe, nor the common or ordinary sort, nor any of the rest not here expressed, are any of them the true Hyssope of the ancient Greeke Writers, but *supposititia*, vsed in the stead thereof. The Germander, from the forme of the leaues like vnto small oaken leaues, had the name *Chamædrys* giuen it, which signifieth a dwarfe Oake.

The Vertues.

The common Hyssope is much vsed in all pectorall medicines, to cut fleagme, and to cause it easily to be auoided. It is vsed of many people in the Country, to be laid vnto cuts or fresh wounds, being bruised, and applyed eyther alone, or with a little Sugar. It is much vsed as a sweet herbe, to be in the windowes of an house. I finde it much commended against the Falling Sickenesse, especially being made into Pils after this manner: Of Hyssope, Horhound, and Castor, of each halfe a dramme, of Peony rootes (the male kinde is onely fit to be vsed for this purpose) two drams, of *Assa fœtida* one scruple: Let them be beaten, and made into pils with the iuyce of Hyssope; which being taken for seuen dayes together at night going to bed, is held to be effectual to giue much ease, if not thoroughly to cure those that are troubled with that disease. The vse of Germander ordinarily is as Tyme, Hyssope, and other such herbes, to border a knot, whereunto it is often appropriate, and the rather, that it might be cut to serue (as I said) for a strewing herbe for the house among others. For the physicall vse it seruеth in diseases of the spleene, and the stopping of vrine, and to procure womens courses.

Fig. 1. Reproduction of page from Parkinson's "Paradisus in Sole, Paradisus Terrestris," describing *Teucrium Chamaedrys*.

For our location in the Middle West we can draw a helpful suggestion from William Robinson in his "The English Flower Garden" (1900 edition). On page 835 of this work he lists *Teucrium Chamaedrys* (wall germander) with some other Teucrium species, and states that "it is found throughout Europe on walls and rocks, and is suitable for borders and naturalisation on ruins, stony banks, etc., in any light soil, whilst as an edging plant it is useful." After reading the above statement we conclude that if this Teucrium is to be successfully grown a light soil must be provided. Since most of our soil is a heavy clay it would be a good plan to incorporate some sand, gravel, or cinders with the soil in poorly drained situations. The longer one grows plants the more one realizes that winter frost injury takes its toll of perennial plants not on account of unusually low temperatures, but because of excessively wet soils during the winter months. For the most interesting description of this germander we must read what Parkinson has to say on page 456 of his "Paradise in Sole, Paradisus Terrestris" published in 1629 (fig. 1), where he tells of the use of this plant for bordering knots and also the origin of the word "Chamaedrys." P. A. K.

A MUCH MALIGNED TREE?

The Tree of Heaven, Ailanthus altissima

According to Mr. W. T. Swingle (*Journal of the Washington Academy of Sciences*, Vol. VI, No. 14, p. 490), the seed of the Tree of Heaven were first sent from China to the Royal Society of London in 1751, by a French Jesuit missionary. Early in the nineteenth century the tree was introduced into the United States by way of Rhode Island, probably through seed sent direct from China. At various times it has borne some half-dozen different botanical names, the one most widely used being *Ailanthus glandulosa*. However, Mr. Swingle has shown that the correct designation, according to the rules of nomenclature, is *Ailanthus altissima* (Miller) Swingle, and it has been so known for the past twenty years.

HEDGE OF TEUCRIUM CHAMAEDRYS BORDERING THE ROSE GARDEN

1

2

3

TREE OF HEAVEN (AILANTHUS ALTISSIMA)

Fig. 1. Flowering branch. Fig. 2. A graceful specimen at the Garden. Fig. 3. Tree grown from seed which had germinated on a roof.

The generic name Ailanthus was derived by Desfontaines in 1786, from *Aylanto,* meaning "heaven-tree," native name of a tree which grew in Amboyna. Swingle points out that curiously enough the older Chinese poets knew the Ailanthus as "God's tree," the common German name *Götterbaum* perpetuating this fact.

So-called "weed trees" are not popular with horticulturists generally. The mere fact of their growing vigorously in localities and under conditions that "no self-respecting tree" would tolerate is regarded as sufficient reason for discarding them. The Ailanthus, or Tree of Heaven, is perhaps the most outstanding weed tree of this region. Professional planters of trees regard themselves as too "humane" to subject any tree to the kind of situation that this outcast enjoys, for the city dump is regarded as its favorite habitat. "Here it elbows its way among discarded plumbing fixtures, or grows boldly through twenty feet of cinders."

Aside from the objections raised against a tree that frequents dumps and cinder piles, a few bad habits must be listed before we admit the Ailanthus to respectable company or regard it as suitable for city beautification. The roots sucker freely, producing shoots which grow into trees, completely overrunning all visible soil. The flowers of the male tree give off a very unpleasant odor. The fertile tree produces such enormous quantities of seeds—most of which germinate—that each year the seedlings must be removed from the crevices in which they have lodged. A seed germinating on the roof of a shed (pl. 24, fig. 3) was capable of developing a tap root which eventually reached the soil. It can grow in the crevice between building and sidewalk, and while growing exert such an enormous pressure that either wall or walk will eventually have to give way. In deeper soil the root system develops more surface roots. In addition, old trees, like many other species, harbor termites and carpenter ants.

This then is the case against the Tree of Heaven. What can be said in its favor? First, the fact that a tree will root and live in unattractive places should not be counted against it.

To paraphrase Mrs. Hubert Bland:

> **The chestnut's proud and the lilac's pretty**
> **The poplar's gentle and tall**
> **But the Ailanthus is kind to the poor dull city**
> **I love him best of all.**

Recognizing that the Tree of Heaven likes people and grows where other trees fall dead, some one has written of it, "It hugs the shabby brick fronts of houses that have seen better days. It sprouts where it can cock a leaf to catch all the doorstep gossip of the ward. It grows its best for the slums, spreading brave young branches to hide cracked panes and broken plaster from the sight of passers-by."

Many trees refuse to live healthily in downtown St. Louis, but the Ailanthus is outstanding in its tolerance of a smoke-laden atmosphere. In fact, it has an international reputation in this regard. Here is a tree that shaded the cradle of ancient civilization and has continued to live with man, following him into the city and staying with him faithfully in spite of steel, gasoline, pavements, tenements, railroads, smoke, sulphur, and slug. In old New York, the streets were lined with Ailanthus, and for generations it was the typical shade tree of the city. The demand for a more aristocratic tree caused it to be replaced by maples, but they and similar trees have not survived.

In the Ailanthus then we have a tree that resists the poisonous gases of a modern city atmosphere; is not subject to insect or fungus pests; is drouth resistant, and hardy as far north as southern Canada. During the season of 1934, it was one of the first of exotic trees to shed its leaves, remaining bare half the summer, but it did not die. Even the leafless trees matured a crop of winged seeds and the spring of 1935 found the Ailanthus flourishing as ever. Add to these qualities, a beauty and grace that is so outstanding (pl. 24, fig. 2) that the Ailanthus is frequently mistaken for some other tree noted for these characteristics. In fact, the red-fruited variety might at a short distance be confused with the mountain ash, which of course refuses to grow in town. But this is not all. As long ago as 1888, the following editorial appeared in *Garden and Forest* for that year:

The only possible objection to the Ailanthus is that the flowers of the male plants have an exceedingly disagreeable odor to some people, and that the pollen is supposed to produce catarrhal troubles. But, as the writer in the *Rural New Yorker* points out, this objection can be very readily obviated by raising plants from root-cuttings taken from the female plants only, and by avoiding the use of seedlings, among which there might be expected to be as many males as females. As the Ailanthus grows rapidly from cuttings, a supply of plants can be secured quickly in this way. A moderately severe pruning of the male trees made in the spring every second year will generally have the effect of stimulating growth to such an extent that the trees will not flower.

Our contemporary hardly does justice, however, to the great economic value of this tree, which is surpassed, in the value of the material which it yields, by few North American trees; and certainly there is no tree which can be made to grow in the United States which can produce so much valuable wood in such a short time. The wood of the Ailanthus must be compared in heat-producing properties with white oak, black walnut and birch. It is less valuable than hickory, but hickory—the best fuel, all things considered, our forests furnish—makes a no more agreeable, although a somewhat hotter fire, than Ailanthus, which burns steadily and slowly without snapping, giving out a clear bright flame and leaving a good bed of coals. The amount of ash left after the combustion of the wood is remarkably small. The great value of the Ailanthus, however, as a source of fuel supply, lies in the fact that it makes wood, even in poor soil, more than twice as rapidly as any of our trees which produce fuel of anything like the same value. The fact has not been demonstrated by experiment, but it is safe to say that an acre of ground planted with Ailanthus would yield at the end of thirty years more than twice as much fuel, in bulk and in actual heat product, as the same piece of ground planted with Hickory or Oak.

Ailanthus wood, in spite of the rapid growth which this tree makes, is both heavy and very strong. It neither shrinks nor warps in seasoning, and as material for the cabinet-maker it has few superiors among woods grown without the tropics. In color it is a clear, bright yellow, and although coarse-grained, it can be made to take a fine polish.

Take it all in all, for hardiness and rapidity of growth, for the power to adapt itself to the dirt and smoke, the dust and drought of cities, for the ability to thrive in the poorest soil, for beauty and for usefulness, this tree, which the Abbé d'Incaville brought back with him from China more than a century ago, is one of the most useful which can be grown in this climate.

THE EARLY HISTORY OF THE TOMATO OR LOVE APPLE

Tomatoes were growing wild in South America long before Columbus discovered the West Indies, and were used by the inhabitants of Peru as an article of food. Early in the sixteenth century some intrepid Spanish church Father must have collected seed of two varieties of tomato and sent them back from the New World to Spain, for we find that in 1554 an Italian botanist named Matthiolus deseribes in the scientifie Latin of that time the tomato as it grew in the gardens of Italy. Under the Latin name of *mala aurea* (golden apple) he designates the fruit. It seems quite likely that he must have seen the plants growing, as he tells of the turning of the fruit from green to red color as it matured. He had also observed a yellow variety.

At that time Matthiolus mentioned no uses, either medicinal or eulinary, for the plant. It is quite in order to believe that he had not tried to eat the fruit. Since the tomato has many of the external characteristics of the other members of the nightshade family, he probably thought it might be poisonous and left it strictly alone. In his book, the tomato is placed along with such drastic and potent drug plants as henbane, nightshade, belladonna, and mandrake. In the course of the ne: t twenty years Matthiolus must have tried to eat a tomato that was overripe for he reports it as being nauseous and having emetie properties. Also during those years the original source of the plant had become known, since he now speaks of it as *poma peruviana* (the apple of Peru). With this account is probably the earliest illustration of the tomato plant.

By 1578, the tomato had reached England where Dodoens writes of it: "This is a strange plant, and not found in this country except in the gardens of the herborists, where it is sowen. . . . all the herbe is of a strange stinking flavour. . . . The strange apples be also of two sortes, one red and the other yellow, but in all other poyntes they be like as in stalks, leaves, and growing." Here the plant is also illustrated (fig. 2), and the name "Apples of Love" or "Golden Apples" for the

Fig. 2. The tomato, or love apple. (From Dodoens, "A Nievve Herball, or Historie of Plants." 1578.)

tomato is first used in print. In connection with the "Nature and Vertue," that is, the medicinal properties of the plant, Dodoens states, "The complexion, nature, and working of this plante is not yet knowen, but that I gather of the taste it should be colde of nature, especially the leaves, somewhat like unto the mandrake, and therefore also is dangerous to be bled."

At about the same time, Camerarius (1586) reported that the plant was grown in Italy, where, macerated in oil, it was highly recommended as a salve for the itch.

John Gerarde (1597) says of the tomato in his "Herball," "Apples of love doe growe in Spaine, Italie, and such hot countries from whence myselfe have received seeds for my garden where they doe increase & prosper." In this account we have the first directions for preparing and eating tomatoes. Under the paragraph headed "The Vertues," it is said that "In Spaine and those hot regions they use to eat the apples prepared and boiled with pepper, salt, and oils; but they yield very little nourishment to the body, and the same naught and corrupt. . . . B. Likewise they do eate the apples with oile, vinegar, and pepper mixed together for sauce to their meate even as we in these cold countries do mustard." Have we here the first recipe for tomato sauce?

By 1600 the tomato had reached most of the European countries, for in one book the English, French, Dutch, Italian, German, and Latin names are all given. In the same work it is said that the tomato was to be used in treatment of erysipelas and glaucoma. Tomatoes had been cultivated so long in Europe that by 1629 their origin was somewhat obscure. Parkinson related:

> They growe naturally in the hot countries of Barbary and Ethiopia, yet some report them to be first brought from Peru, a province of the West Indies. We only have them for curiosity in our gardens and for the amorous aspect or beauty of their fruit. . . . We call them in English, Apples of Love, Love-apples, Golden Apples, Amorous apples. . . . In the hot countries where they naturally growe, they are much eaten of the people, to coole and quench the heate and thirst of their hot stomaches. The Apples also boyled, or infused with oyle in the sunne, is thought to be good to cure the itch, assuredly it will allay the heate thereof.

In the above quotation is the only explanation to be found among early writers explaining the origin of the names "golden apple," and later "apple of love."

Apparently the tomato languished in the gardens of the botanists and herborists for a long time, and did not become an important food plant in England before the nineteenth century. The following account of tomato raising in England will indicate that some of the growers' troubles then were closely akin to the modern ones. The writer of the article, Joseph Sabine, was an English barrister who was for many years Secretary of the Royal Horticultural Society.

ON THE LOVE APPLE OR TOMATO . . .

By Joseph Sabine, Esq., F. R. S. etc., &c Secretary
Read January 5, 1819

The great use which has been made of the *Tomato* of late years for culinary purposes, has occasioned it not only to be regularly grown in private gardens, but has also rendered it an object of cultivation for the market of the metropolis. Possessing in itself an agreeable acid, a quality very unusual in ripe vegetables, it is quite distinct from any other product of the kitchen garden. It appears to be used, when fresh, in a variety of ways in soups and sauces; and its juice is preserved for winter use in the manner of ketchup.

To the old gardeners and botanists the plants were known by the more regular name of *Solanum pomiferum,* and they were also called *Poma amoris, Poma aurea, Mala aurea, Love Apples, Amorous Apples* and *Golden Apples.*[1]

. . . I am indebted to our worthy member, Mr. John Wilmot of Isleworth, for the following account (dated 31st December, 1818) of his cultivation and crops of the plant in question. . . . "In the beginning of March I sow a quantity of the seed in the Pine stove. The plants in a few days are fit to be put out into shallow pans . . . are kept a few days in the Pine-house, and then removed into a cooler situation, until the beginning of April. I then pot these plants singly into sixty-sized pots, in which they continue until the season admits of their being put out; which is not until the beginning of May, at which period little injury from frost, which is fatal to the plants, will occur. . . . In private gardens it is the practice to put the plants against a wall, training them to it, but I consider a bank to be much the most congenial situation for the Tomato.

"My crop in the last season amounted to six hundred plants, and I suppose I gathered from them four hundred half seives

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[1] Linnaeus called the tomato *Solanum Lycopersicum,* and it is now known botanically as *Lycopersicum esculentum.*

of fruit for the market, each half seive weighing about twenty pounds [a half seive is the third part of a bushel]. From the extraordinary fine season, the growth of this fruit round London exceeded the demand, and I had therefore a great quantity undisposed of; taking this and the unripe fruit into account, I am satisfied that on an average each plant produced twenty pounds weight. . . . Individual fruits were this year of extraordinary size, many of them exceeding twelve inches in circumference, and weighing twelve ounces each. . . ."

Miller in his "Gardener's Dictionary," 1752, says:

> The Italians and Spaniards eat these Apples [Tomatoes] as we do Cucumbers, with Pepper, Oil, and Salt, and some eat them in Sawces, etc. and in Soups they are now much used in *England*, especially this Sort which is preferred to all the other. This Fruit gives an agreeable Acid to the Soup; though there are some Persons who think them not wholsome, from their great Moisture and Coldness. . . .

We do not know for certain the date when tomatoes were brought to this country. In Philadelphia (1784) tomatoes "were first demanded by the French emigrants, and there was little sale for them to others." In McMahon's seed list of 1806 (see Mo. Bot. Gard. Bull. **20**: 75. *pl. 22.* 1932), "Tomatoes or Love Apple" are listed under garden flowers, while in 1837 they are principally known under the latter name.

After about 1850 tomatoes were generally listed in seed catalogues. In the early sixties one finds them under "love apple or tomato"; only later in that decade are they transferred from the flower border to the kitchen garden and listed as "tomatoes or love apples." Soon afterward they seem to be on their own and are solely and rightfully listed as tomatoes. In spite of the use of the tomato as food and in sauces in countries with warmer climates, it was not generally eaten in the United States until after the middle of the last century. Plants were grown to be looked at, but the fruit was supposed to be poisonous. Many of the plants related closely to the tomato have chemical substances which are poisons if taken in large quantities, so it was natural for untrained people to assume that because the tomato had the superficial characteristics of these medicinal plants it had the same hidden and virulent principles.

John Adam Moore.

NOTES

Mr. G. H. Pring, Superintendent of the Garden, lectured before the St. Louis Association of Gardeners at the John Burroughs School, October 5, on "The Association Between Insects and Plants."

Dr. Edgar Anderson, Geneticist to the Garden, and Dr. R. E. Woodson, Research Assistant, are joint authors of "The Species of Tradescantia Indigenous to the United States," which has recently been published as *Contributions from the Arnold Arboretum of Harvard University*, No. 9.

Among recent visitors to the Garden were Mr. J. Horace McFarland, horticultural publisher and president-emeritus of the American Rose Society; Mr. J. E. Higgins, Director of the Summit Experiment Station, Canal Zone, Panama; Dr. Lawrence M. Ames, of the Division of Plant Disease Eradication and Control, Barberry Eradication, Arnold Arboretum, Jamaica Plain, Mass.

On the morning of the opening of the convention of the American Legion, a large bowl containing a collection of the finest tropical water-lilies was presented to the National Commander, Mr. Frank N. Belgrano, and remained on the rostrum during the sessions of the convention. A corsage bouquet of orchids was presented to the President of the Legion Auxiliary during the time it was in session in St. Louis.

At the fifty-seventh Veiled Prophet's Ball, held on October 9, the Queen, Miss Lila M. Childress, carried a magnificent bouquet of orchids, provided by the Garden. The bouquet contained between two and three hundred blossoms in fifty-nine varieties. New hybrid forms of Cattleyas and Laelio-Cattleyas, the pink moth orchid from Australia, the rare blue moth orchid from India, the white moth orchid from the Philippines and pale green lady-slippers from the East Indies were of especial interest in the bouquet.

At the Air-Mail Flower Show held in Milwaukee, September 11, 12, and 13, the St. Louis Post-office was awarded the following prizes:

"Best Orchid Exhibit," First Prize. Orchids furnished by the Missouri Botanical Garden. Some twenty other exhibits were shown from various parts of the country, including Oregon, Washington, California and Massachusetts.

"Most Unique Flower Exhibit," Second Prize. For Anthuriums furnished by the Missouri Botanical Garden.

The current number of the ANNALS OF THE MISSOURI BOTANICAL GARDEN which has just appeared, will be of unusual interest to the public at large. Entitled "An Annotated Catalogue of the Flowering Plants of Missouri," it is a work of nearly 400 pages and is the first comprehensive Flora of the entire state. It represents a lifetime of work on the part of the two authors, Mr. Ernest J. Palmer, of Harvard University, and Dr. Julian A. Steyermark, Instructor in General Biology at the University City High School. Both authors were admirably qualified to undertake such a work, and it is appropriate that it should be published by the Missouri Botanical Garden, since each of them was formerly connected with this institution. Mr. Palmer was from early childhood a resident of Webb City, Missouri, where his work on the geology and flora of that region brought him an international reputation as a collector. He eventually became a member of the staff of the Missouri Botanical Garden and since 1922 has been connected with Harvard University. Dr. Steyermark is a native of St. Louis, and received his technical training very largely at Washington University and the Missouri Botanical Garden.

The catalogue itself is preceded by a history of botanical collecting in Missouri and a discussion of the flora of the state in relation to its geology and climate, a discussion which is particularly valuable since both authors are unusually conversant with the geology of Missouri. It is followed by a complete index which lists common names as well as botanical ones, making the book more useful to the amateur. There are six plates illustrating typical plant habitats, and one showing a few unusual or noteworthy species.

Because of its general interest a few extra copies of the Catalogue have been prepared and are for sale to the general public at $5.00 apiece.

STATISTICAL INFORMATION FOR SEPTEMBER, 1935

GARDEN ATTENDANCE:

Total number of visitors.....36,382

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought.....	24
Total number of books and pamphlets donated.....	164

PLANT ACCESSIONS:

Total number of plants donated.....	177
Total number of packets of seed donated.....	50

HERBARIUM ACCESSIONS:

By Purchase—	
Faure, A.—Plants of northern Africa.....	500
By Gift—	
Bailey, L. H.—Apocynaceae from Brazil.....	14
Barkley, F. A.—*Crotalaria sagittalis* L. from Oklahoma.	1
Buchtien, O.—Plants of Bolivia.....	19
Chaney, R. W.—Plants of Mexico.....	200±
Fuller, H. J.—Plants of horticulture.....	2
Gage, D. S.—*Helianthus tuberosus* L. from Missouri....	1
Greenman, J. M.—Plants of Holland.....	9
Locke, D. R.—Plants of Texas.....	5
Lodewyks, Maude C.—*Tridens flavus* (L.) Hitchcock from Missouri	1
Neill, J.—Plants of Illinois.....	3
New York Botanical Garden—Lichens of Hispaniola...	100±
Obee, D. J.—*Sclerotium delphinii* from Kansas.....	1
von Schrenk, H.—Plants of Missouri.....	4
By Exchange—	
Botaniska Avdelning, Riksmuseets, Stockholm—Lichens of Brazil.....	331
Total.....	1,191

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

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MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XXIII NOVEMBER, 1935 No. 9

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1935

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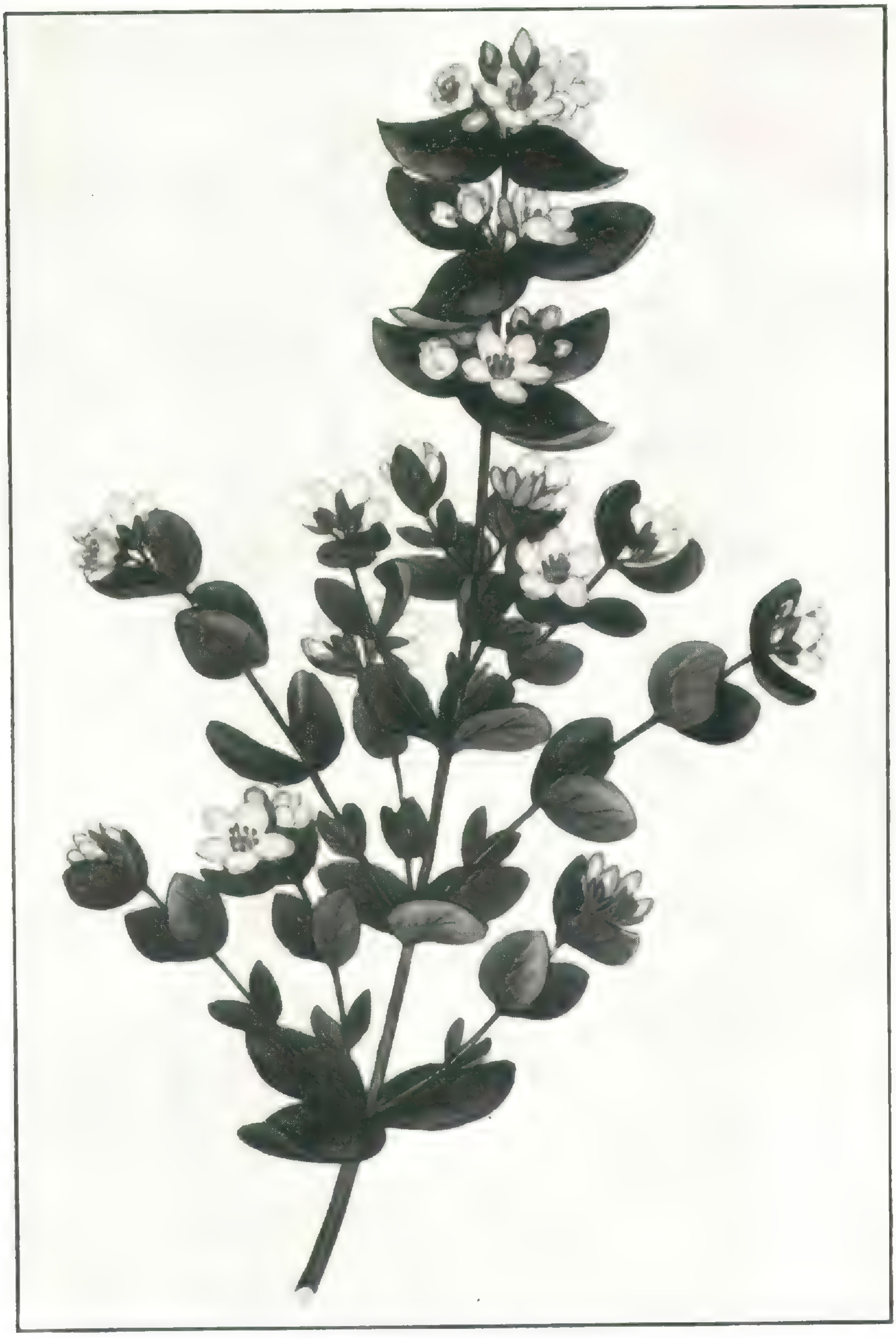


HYPERICUM VIRGINICUM (HIGH-JOHN-THE-CONQUEROR)
(From Andrews, Botanical Repository, Vol. 8, pl. 552, 1808)

Missouri Botanical Garden Bulletin

Vol. XXIII NOVEMBER, 1935 No 9.

NEGRO HERB DOCTORING

It is a surprising fact that negro medicine as a subject of folk lore has been almost entirely neglected. Indian doctoring has often been investigated, but, with the exception of Ruth Bass's excellent article "*Fern Seed—For Peace,*" we know of no outstanding work on negro doctoring. We became interested in the subject while collecting drug plants in Mississippi, where some of the "doctors" we met engaged our attention quite as much as the drugs collected.

In contrast with the Indians and most other primitive people, where progress in medicine has been shown, the negro has not progressed at all, but more often retrogressed. In the not-too-distant past the better class of slave owners had the negro slaves looked after by their family physicians. That the negroes were usually cared for as conscientiously as their white masters seems to have been the usual practice. Of course, the service rendered the slaves varied on different plantations, so that in some instances they were wholly reliant for medical care on members of their own race. Perhaps the spirit of the negro herb doctor can best be illustrated by quoting several paragraph from "*Fern Seed—For Peace*":[1]

> High-John-the-conqueror[2]! Rattlesnake-master[3]! Asthma-root[4]! Devil's-shoestring[5]! Sampson-snakeroot[6]! Shame-weed[7]! Their very names are magic and conjure back

[1] From "Folk-Say: A Regional Miscellany," pp. 145–156. Copyright 1930 by B. A. Botkin. Reprinted by kind permission of the publishers, the University of Oklahoma Press.

[2] *Hypericum virginicum* L.
[3] *Eryngium yuccifolium* Michx.
[4] *Lobelia inflata* L.
[5] *Tephrosia virginiana* (L.) Pers.
[6] *Psoralea pedunculata* (Mill.) Vail.
[7] *Geranium maculatum* L.

the fragrance of all of childhood's summers, even though they might be dispossessed of their spirit, the essence of the herb that healed. Where Old Con acquired her knowledge nobody knew. Perhaps not simply her own life but the lives of her forefathers had given their share to her appalling amount of plant lore. Perhaps she belonged, as she always maintained, to the same world as the swamp with its cypresses, its bayous, its birds, and its scents of sweet bay, candleberry, and witchwood; so intelligence drew on the same source as nature. She presumed always that the spirit which quickened her own nimble body was of the same essence which animates all living things.

. . . . . .

There is a plant provided for every kind of ailment; we simply have to find what has always existed for us, Old Con used to say. And she had found a use for every plant that grew in the swamp, the fields, or about people's houses.

The king root of all the forest is high-John-the-conqueror. It will ward off any disease that has been brought on by conjure and all witches quake when they see a bit of it in a person's hand. This magic plant is the marsh St. John's-wort, a member of the same family which in Europe has been credited with the power of preserving people against lightning. In the swamps of the South the Negroes fear to tread on this plant lest they be seized and borne away by "hants." It is commonly placed under the doorsteps to prevent the nightly visitations of ghosts, witches, and nightmares. It is a cure-all for any kind of wound, and the dew that gathers upon its leaves is excellent for strengthening the eyesight.

Sampson-snakeroot, a member of the pea family whose flower is of a purplish color and whose long, tough root is a "rattlesnake master," holds a place in the swamp Negro's affections next to tobacco and coffee. Its roots are boiled into a powerful and invigorating tonic, and they drink it by the jugfuls. It is a sure cure for cramping and for loss of manhood. Chewing this root and spitting its juice at a person's feet will give the chewer the control over that person. Always chew some Sampson-snakeroot while trading and you will get the best of the bargain. . . .

Con also taught me that wrapping in leaves of "Palma-Christian," or castor-oil plant, will not only cure chills and fever but as poultices the leaves will relieve headache and "heatin'-spells." Waving chinaberry leaves at them will drive off unwanted animals and insects such as stray dogs, goats, flies, or mosquitoes. But never wave a chinaberry limb at a stray cat! Even the rank-growing, evil-smelling weeds about the cabin lots all have some power.

. . . . . .

"Put dis undah yo pillah, Hon. Hit's stuffed wid cattail fuzz an' blood-o-Jesus leaves. Wid roses an' lavendah foh

> sweetness, an' fern seed foh peace. Sleep wid hit, Baby. Hit'll bring yo peace an' safety." She blew out the candle and stood. . . .

"Ed" was a typical herb collector who, for many years, had been collecting drugs. About his only cash revenue was from his collection of drug plants, which he sold directly to a fur company in Kansas City. He also transplanted a great number of the plants into the gardens of "white folks," and he admitted that he had exhausted his supply of lady's-slipper attempting to fill the demand for them as ornamentals.

Ed was very indifferent as to the source of his knowledge. He was very eager, however, to learn new plants and grateful for any aid. When a plant was found which he did not know he would take it up and examine it very closely and repeat the name over and over. He would come to the office with some of his collections for identification. While there he would usually ask to look at an illustrated flora, through which he would pore until he found a plant that he knew, when he would say the name over and over until he was sure he could remember it. One new name would usually satisfy him, but the next time he would be just as enthusiastic to learn another new one. In most cases he was fairly accurate in his identifications with the one exception, when he was found collecting *Comandra umbellata* (L.) Nutt., for *Coptis trifolia* (L.) Salisb.

Ed's greatest difficulty was in finding names for his plants. In one instance he constantly referred to alum root (*Heuchera americana* L.) as thunder-root. Thinking that it was most likely used in some rain-making ritual, he was asked why he called it by that name. His reply was, "We-ell po'fessah, yo'all sees it's just like dis. Ah keeps a-findin' dis heah plant and nobody what Ah asks done knows no mo' 'bout it dan Ah does. Ah gets regusted one day an' just throws dis heah ol' plant down and says to maself, 'thundeh.' After that Ah gits to thinking dat su' enuff fits it. So Ah just calls it 'thundeh-root.'"

Ed did not use any of his drugs himself and apparently supplied none of the local herb doctors. He knew where to find most of the drug plants for which there was a demand. The

rarer they were, the more he sought them, since they usually brought a much better price.

In one instance we found an unusual case of a negro herb doctor commercializing his business on a large scale. Several years ago this negro, whose name the authors failed to obtain, set up his camp in the woods in southeastern Mississippi. His consultation room was in the open and consisted of a small table placed against a tree, behind which he sat. He would ask the patient a few questions, scribble a number on a blank square of paper, and collect the dollar fee. This also paid for the medicine, which was prepared by near-by helpers in pots and pans of various sizes and descriptions. His herbs were all procured from commercial herb houses, and in most cases mixed ready for preparation of his numbered formulas. Miraculous cures were ascribed to him, and soon the woods surrounding his camp were overrun with sick, both white and colored. The camp soon took on the aspect of a boom town. His business prospered for many months, with ever increasing clientele, before the authorities clamped down on him.

Aunt Rhoda was a typical negro herb doctor whose age may have been anywhere between forty and eighty. She was of rather stocky build and very active. She wore a heavy knitted turban and a slip-over sweater, and many voluminous skirts in which she would carry home her collection of drugs. Her formulas were for the most part taken from a "doctor book," and her knowledge of plants came mostly from her "grand-mammy." The twenty or more plants pointed out by Aunt Rhoda were named correctly without exception. She gathered most of her drugs, but if she needed others not procurable she bought them from herb houses. Her clientele consisted of colored folks, and her fee varied with their means. Some of Aunt Rhoda's remedies which follow are quite representative of the type and diversity of negro herb formulas:

1. A decoction recommended for stomach trouble, prepared by boiling in a gallon of water (which was later cooled and strained) a handful of each of the following herbs: star root (*Aletris farinosa* L.), golden seal (*Hydrastis canadensis* L.), yellow dock (*Rumex crispus* L.), corn (*Zea Mays* L.), silk

mouse-ear (*Cerastium viscosum* L.), mullein (*Verbascum* spp.), seven barks (*Hydrangea arborescens* L.), St. John's-wort (*Hypericum* spp.), strawberry (*Fragaria* spp.), boneset (*Eupatorium perfoliatum* L.), wild cherry (*Prunus* spp.), dandelion (*Taraxacum* spp.), wild sarsaparilla (*Aralia nudicaulis* L.), Solomon's seal (*Polygonatum* spp.), hops (*Humulus Lupulus* L.), black root (*Veronicastrum virginicum* (L.) Farwell), and plantain (*Plantago* spp.)

2. A mixture of English plantain (*Plantago lanceolata* L.) and garlic (*Allium sativum* L.) was used for coughs and kidney trouble.

3. For dysentery, it was recommended that there be taken every four hours, a wineglassful of a decoction prepared by boiling in a gallon of water for five minutes, cooling, and straining, a handful of each of the following: lily root (? *Convallaria majalis* L.), white oak bark (*Quercus alba* L.), St. John's-wort (*Hypericum* spp.), shaw-berry (?), plantain (*Plantago* spp.), peppermint (*Mentha piperita* L.), alum root (*Heuchera americana* L.), life-everlasting (*Gnaphalium* spp.), hazelnut bark (*Corylus americana* Walt.), huckleberry root (*Vaccinium* spp.), blackberry root (*Rubus* spp.), sweet gum bark (*Liquidambar Styraciflua* L.), sumac (*Rhus glabra* L.), slippery elm bark (*Ulmus fulva* Michx.), and ragweed (*Ambrosia* spp.).

4. A tablespoonful of an infusion prepared by steeping for an hour, in a pint of hot water, a small amount of poplar (*Populus* sp.), wild cherry bark (*Prunus* spp.), dogwood bark (*Cornus florida* L.), mistletoe (*Phoradendron flavescens* (Pursh) Nutt.), vervain (*Verbena hastata* L.), peppermint (*Mentha piperita* L.), and dog fennel (*Anthemis Cotula* L.), was recommended for neuralgia.

5. A decoction made by boiling, in a gallon of water, a handful of each (or if all are not available, any seven or eleven) of the following, was used for pleurisy: mullein (*Verbascum* spp.), wild cherry bark (*Prunus* spp.), vervain (*Verbena hastata* L.), dog fennel (*Anthemis Cotula* L.), huckleberry leaves (*Vaccinium* spp.), slippery elm bark (*Ulmus fulva* Michx.), prickly ash root (*Zanthoxylum* sp.), horehound (*Mar-*

rubium vulgare L.), sassafras bark (*Sassafras officinale* Nees & Eberm.), poke root (*Phytolacca americana* L.), Arbor vitae (*Thuya occidentalis* L.), ground pine herb (*Lycopodium* spp.), skunk cabbage (*Symplocarpus foetidus* Nutt.), horseradish (*Roripa Armoracia* (L.) Hitchc.), horse mint (*Monarda* spp.), water pepper (*Polygonum hydropiperoides* Michx.), Virginia snakeroot (*Aristolochia serpentaria* L.), and bitter herb (*Chelone glabra* L.).

6. A bitter tonic, a tablespoonful of which was to be taken before each meal, was to be made by boiling, in a pint of water, a handful of star root (*Aletris farinosa* L.), golden seal (*Hydrastis canadensis* L.), wild cherry bark (*Prunus* spp.), hops (*Humulus Lupulus* L.), May-apple root (*Podophyllum peltatum* L.), prickly ash root (*Zanthoxylum* spp.), squaw weed (*Senecio aureus* L.), black snakeroot (*Cimicifuga racemosa* (L.) Nutt.), horehound (*Marrubium vulgare* L.), ironweed (*Vernonia* spp.), willow bark (*Salix* spp.), and skullcap (*Scutellaria* spp.).

7. A decoction consisting of a handful of boneset (*Eupatorium perfoliatum* L.), dandelion (*Taraxacum* spp.), vervain (*Verbena hastata* L.), dog fennel (*Anthemis Cotula* L.), May-apple root (*Podophyllum peltatum* L.), smart weed (*Polygonum hydropiperoides* Michx.), poke root (*Phytolacca americana* L.), and calamus root (*Acorus Calamus* L.), boiled in a quart of water, was recommended for the "spleen."

8. For coughs and colds a decoction was made by boiling in a gallon of water, a handful of skunk cabbage (*Symplocarpus foetidus* Nutt.), pine bark (*Pinus* spp.), Senega (*Polygala Senega* L.), horse nettle leaves (*Solanum carolinense* L.), cockle-bur (*Xanthium* spp.), high-John-the-conqueror (*Hypericum virginicum* L.), spikenard (*Aralia racemosa* L.), mullein (*Verbascum* spp.), wild cherry bark (*Prunus* spp.), Solomon's seal (*Polygonatum* spp.), black root (*Veronicastrum virginicum* (L.) Farwell), life-everlasting (*Gnaphalium* spp.), sweet gum (*Liquidambar Styraciflua* L.), horehound (*Marrubium vulgare* L.), violet (*Viola* spp.), and Spanish needle root (*Yucca* spp.). A dose was a wineglassful to which a teaspoonful of sugar was added.

From the above, it can readily be seen that the formulas are usually of the "shot-gun" type—that is, they contain enough drugs to be likely to have something for almost any ailment.

An insight into the present status of negro doctoring may be had by quoting again from *"Fern Seed—For Peace"*:

> **Perhaps a few Southern children still tag at the heels of Negro servants from nursery to kitchen, from kitchen to cabin and field and swamp where high-John-the-conqueror rules and sweet bay and candleberry and a hundred other herbs of magic sweetness offer fragrant balm for many a heartache. Theirs is an experience that sages may well envy. To them nature will always be a harvest that can be gathered when and where they find it growing. It is an opportunity that will vanish before many years. Educational and mechanical sciences are encroaching upon this swamp and field lore. Already the more sophisticated Negroes despise this crude yet natural magic of tree and flower. Old Con is gone, and not one of her own children or grandchildren have claimed the legacy of her plant knowledge. Only in the heart of her big-eyed, solemn, white-baby does fern seed still bring peace and vervain kindle love. Though old Con's flickering, pitch-pine torch has gone out and the ghostly plat-eyes wander aimlessly over the lowland, lonely and forsaken—the spirit of the swamp is still friendly to those who care for its knowledge. In its dim, sweet places where the yellow jasmine tosses its blossoms in showers of gold the human heart, whether white or black, can steal away to God.**
>
> WILLIAM W. AND FRED A. BARKLEY.

A TEST OF THE 1935 "ALL AMERICAN ANNUALS"

In addition to the honorary football and baseball teams, we now have the All American annuals which include the most outstanding annual flowers originated each year by prominent seedsmen in the United States and foreign countries. Numerous tests of these new flowering plants are made by reliable horticulturists in various parts of the country and the voting recorded by mail. This results in the selection of the most promising annuals, which receive a certificate of honor, a gold medal, an award of merit, or special mention, according to their respective values as determined by the voters. Conscientious gardeners will appreciate this information, since it is often difficult, if not impossible, to duplicate in the garden some of the alluring new novelties which appear in those inspirational

spring seed catalogues. Competent roguing is necessary, and the impartial choice of the All American annuals is a definite contribution to more successful gardening. It seems, however, that this service would be more complete if a few cultural requirements were supplied with the names of the prize winners, since it is to be expected that these plants will react differently when exposed to diverse soil and climatic conditions. In spite of repeated failures, many gardeners are still laboring under the false impression that they should be able to grow almost every kind of plant regardless of ecological factors.

Before discussing the prize winners it should be emphasized that this report is based solely on 1935 performance. The past growing season was somewhat erratic; many plants which ordinarily make a splendid showing were considerably below par from start to finish. Another season's trial might result in a very different rating for several of the contestants.

PRIZE-WINNING ANNUALS LISTED IN THE ORDER OF THEIR RATING BY THE 1935 "ALL AMERICAN COUNCIL"

1. Snapdragon "University of California Rust-proof Mixture." Awarded a Certificate of Honor.—In many sections of the country it has been practically impossible to grow snapdragons in the garden due to the presence of a rust disease which defoliates and finally kills the plants. The new rust-proof antirrhinum was considered such an advance over the old types that the All American council awarded it a certificate of honor, the first to be issued.

The cold wet spring weather retarded the growth of the plants, but in late summer and fall they developed well, producing many rich-colored flowers. These snapdragons are dwarf in habit and apparently tolerate summer heat, consequently they should make a favorable impression in the Midwest.

2. Cosmos "Klondyke Orange Flare." Grand Champion of the Gold Medal winners (96½ points).—This cosmos was an extremely popular annual in the 1935 competition. It is an early-flowering strain that blooms in less than four months from seeding. The single vivid orange flowers are produced abun-

dantly on bushy plants about three feet high. It is well adapted to northern gardens and grows to perfection in Missouri, flowering continuously from July until cut down by frost in October.

3. Nasturtium "Scarlet Gleam." Awarded a Gold Medal (51½ points).—An unusually fine nasturtium. Semi-dwarf, attractive plants with double sweet-scented, scarlet flowers. This delightful annual is easy to grow and should become very popular. Aphids which invariably appear on the leaves can be discouraged readily with nicotine sulphate spray.

4. Marigold "Yellow Supreme." Awarded a Gold Medal (45 points).—"Yellow Supreme" is an attractive marigold with practically odorless foliage. The plants grow about three feet high, and the large, double-frilled flowers are a rich lemon-yellow color. Good for bedding and useful as a cut-flower.

One objectionable feature of "Yellow Supreme" during the past season was its relatively short duration in the garden. After making a splendid display, all the plants died about the middle of August.

5. Calendula "Orange Shaggy." Awarded a Gold Medal (43 points).—An adequate report on this calendula is not possible at the present time. During the spring the plants made a rapid and sturdy growth, but upon the advent of the hot summer days, they degenerated with astonishing finality. Not a single plant survived. Calendulas enjoy a cool climate, and so could hardly be expected to flourish in St. Louis.

6. Zinnia "Fantasy Mixed." An Award of Merit (40 points).—A graceful new type of zinnia. The rounded flowers have neatly quilled and twisted petals in a pleasing variety of colors. More refined and delicate in appearance than the ordinary types of zinnias.

The plants grew well and bloomed freely the early part of summer, but gradually expired as the season advanced. No doubt the excess rainfall contributed to the untimely death of this zinnia, and another trial will be necessary to determine its normal response.

7. Petunia "Martha Washington." An Award of Merit (40 points).—A compact, dwarf, ball-shaped plant producing ruffled, blush-white flowers tinged with lavender and blue-violet.

The growth of the "Martha Washington" petunias was decidedly inferior and the flower display not particularly impressive. It was the almost universal experience in St. Louis that the season was particularly bad for petunias of all kinds.

8. Nasturtium "Glorious Gleam Hybrids." An Award of Merit (32½ points).—These new double sweet-scented nasturtiums are really excellent. The plants are well proportioned with an abundance of attractive flowers in a wide range of new colors. Especially effective when trailing over a rock wall.

9. Phlox "Gigantea Art Shades." An Award of Merit (30 points).—A highly desirable type of phlox with large flowers in striking new colors. A further trial will be necessary to ascertain the merits of this novelty, since it was prematurely destroyed by inclement weather.

10. Dianthus laciniatus splendens. Special Mention (22 points).—A striking dwarf, compact plant with large, velvety, crimson flowers having a prominent white eye. All the various types of dianthus grow well in Missouri, and this new introduction is especially recommended.

11. Verbena "Violet Bouquet." Special Mention (20 points).—Compact sturdy plants with deep violet-red flowers having a distinct white eye. Verbenas should be used liberally in the garden, for they are both colorful and dependable. "Violet Bouquet" is certainly worth trying.

12. Celosia "Flame of Fire." Special Mention (16½ points).—"Flame of Fire" is one of the most desirable celosias. Dwarf in habit with attractive red flower heads, it is useful in the garden as an accent plant.

13. Anchusa "Annual Blue Bird." Special Mention (16 points).—Further trial of this novelty is necessary, as the plants failed to mature properly.

14. The following marigolds of English origin also received special mention, but were not tested at the Garden:

Golden Beauty (15 points)
Yellow Beauty (14 points)
Primrose Queen (14 points)

The annuals considered in this report will be found listed in most of the prominent seed catalogues. D. C. F.

DASYLIRIONS

Dasylirion is a genus of very ornamental plants belonging to the lily family. They are Mexican in origin, with the exception of two or three species which are found in Texas, New Mexico, and Arizona, and usually grow in rough stony places, such as rocky canyon slopes. The Mexicans use these plants in the manufacture of an alcoholic beverage, which they call "sotol," and this name is likewise applied to the plants. All species of Dasylirion are characterized by heavy plume-like leaves rising from a crowded head, the oldest leaves drooping to the ground. They are suitable both as decorative plants in conservatories and for outdoor plantings in warmer climes. When the ends of the long leaves are cut away, the basal parts form a thick cabbage-like crown or "core" at the head of the stem. These cores are said to be very palatable, and formerly the natives often roasted them for food, a custom now seldom practiced except perhaps in the most remote parts of Mexico. Early botanists tell of these roastings when the aborigines feasted and got drunk on the fiery drink distilled from the sotol cores.

The graceful *Dasylirion Wheeleri,* one of the spiny-margined sotols, is usually found growing among the rocks on the foothills and mesas near the mountains. This species and *D. texanum* are said to be a good substitute for the range grasses when the latter fail (New Mexico Agr. Exp. Sta. Bull. 18 and 114). Although cattle can subsist through long periods of drouth on the sotol alone, the various state experiment stations recommend the addition of other highly nitrogenous substances, such as alfalfa. The brush-tip sotol (*D. acrotrichum*), native of east-central Mexico, is very conspicuous on account of its leaves which terminate in brush-like tufts of coarse fibers (pl. 27, fig. 1).

The Dasylirions often produce flower stalks ten to fifteen feet high, but their individual flowers are not so showy as those of their near relatives, the yuccas and nolinas. Curiously, the

flowers of the sotols are dioecious, that is, the male and female parts are on separate plants, and, in order to effect pollination, the staminate and pistillate (male and female) plants must be near each other. The pollinating agents are various—flies, bees, and wasps.

The sotols are fairly well represented in the Garden's collection of desert plants. Though they do not flower so frequently in cultivation, the flowering period does not necessarily terminate the life of these plants, as so often happens among the agaves. After waiting eighteen years *Dasylirion serratifolium* again condescended to reward us with its tall inflorescence, and last spring it held the "spotlight" in the desert house. In general appearance *D. serratifolium* resembles *D. acrotrichum*, but its foliage is less stiff and more curved, and it does not produce so graceful an effect as does the latter plant. There are other differences which readily distinguish these two plants, such as the greater length and width of the leaves in *D. serratifolium*, and the larger inflorescence in *D. acrotrichum*.

The Garden specimen of *D. serratifolium* has produced a stem two and one-half feet high, which is crowned by a dense rosette of more or less glaucous, spiny-margined leaves. The trunk is only fourteen inches in circumference, but because it is closely clothed with the dilated bases of the fallen leaves, it gives the appearance of being many times that size. The leaves are four feet and more long, three-fourths of an inch broad above their dilated bases, very gradually tapering to the tips, but not terminated by harsh tufts of coarse hairs, as in *D. acrotrichum*. The margins of the serrated leaves are beset with many small, forward-pointing teeth (similar to a double-edged band saw), unequally spaced, pale yellowish in color and very sharp (pl. 26, fig. 1). The flower stalk began making its appearance late in April, at first resembling an asparagus stalk with its erect, imbricated young leaves; then with astonishing rapidity it grew until it attained a height of eleven feet (pl. 27, fig. 3), when growth suddenly stopped and the tiny flower buds around the upper portion of the stalk began to thicken. One month from the first appearance of the flower stalk, the tiny blossoms began to unfurl their showy stamens, exactly as they did

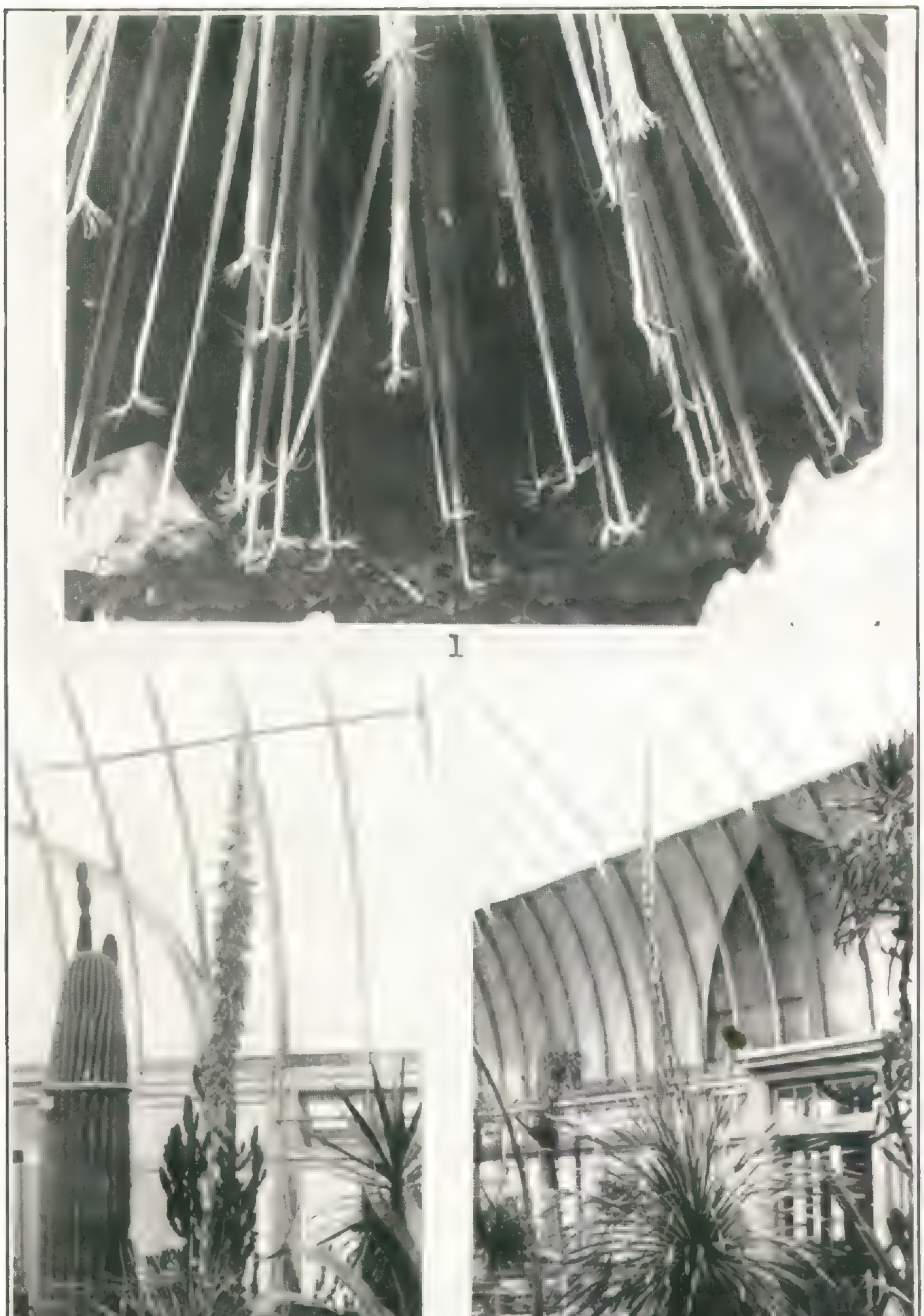
1

BAND-SAW LEAVES OF DASYLIRION SERRATIFOLIUM

2

FLOWER SPIKELET OF DASYLIRION SERRATIFOLIUM

MO. BOT. GARD. BULL., VOL. 23, 1935



1. BRUSH-LIKE TIPS OF LEAVES OF DASYLIRION ACROTRICHUM. 2. INFLORESCENCE OF DASYLIRION SERRATIFOLIUM, JUNE, 1917. 3. INFLORESCENCE OF DASYLIRION SERRATIFOLIUM, MAY, 1935.

eighteen years ago. The flowers are very small, but densely crowded on the spikelets (pl. 26, fig. 2), each with six large stamens (large, that is, for the size of the flower) crowned by oblong yellow anthers. Though thousands of tiny blossoms were produced along this eleven-foot spike, no seeds resulted, as all the flowers were staminate. L. C.

ORCHIDS FOR THE QUEEN

For an entire decade the Veiled Prophet's Queen has been presented with an orchid bouquet from the collections of the Missouri Botanical Garden. So far as details are concerned, this ten-year procession of exotic bouquets is a varied lot. One year will see the inclusion of several waxy Cymbidiums, another will find them lacking entirely, their places taken by the pure white, dove-like blossoms of the "Holy Ghost' orchid. Since 1931 the graceful, fluttering blooms of the "Baby Moth" have given an added elegance to the arrangements; several years have seen the inclusion of those elfin rarities known by the peculiar name of "Botanical Orchids." There is, however, a strong family resemblance running through the whole series. The large-flowered Cattleya, the common florists' orchid, has always predominated, often in combination with its hybrids, the Laelio-Cattleyas and Brasso-Cattleyas. The prevailing shades have been mauve or pinkish with flashes of brighter color. A few lady-slippers have been included every year, providing a contrasting note with their shiny greens and dark chocolates, adding strength to the composition with their bold, bizarre shapes.

The first major change in the appearance of the bouquets was in 1934 when the Garden's own hybrids were used. Their very quantity made possible the production of duplicate bouquets: one for the Queen to carry; one to display at the Garden for the delight of the general public. For all their dainty loveliness, orchids are among the most durable of flowers. Last year and this it has been possible to hold the duplicate bouquet on display for a full week, and even at the end of that

time many of the individual flowers were still in excellent condition

As more and more of the Garden's hybrid seedlings come to maturity during the next few years they may be expected eventually to dominate the Queen's bouquet. Their deeper, richer colors will produce gorgeous effects, their abundance will make it possible to provide duplicates for public display. Wild orchids from tropical jungles, a cosmopolitan collection from the old world and the new, will be superseded by native St. Louis orchids, bred and raised to maturity in the greenhouses of the Missouri Botanical Garden.

As a matter of record the bouquets of the last six years are listed below in the full Graeco-Latin splendor of their scientific names.

1930

Cattleya labiata
Laelio-Cattleya hybrids
Paphiopedilum hybrids
Epidendrum species
Dendrobium Phalaenopsis
Phalaenopsis Lueddemanniana
Brassavola nodosa

1931

Cattleya labiata
Cattleya Trianae
Cattleya Bowringiana
Laelio-Cattleya hybrids
Paphiopedilum hybrids
Cymbidium hybrids
Dendrobium Phalaenopsis
Botanical Orchids

1932

Cattleya labiata
Cattleya Bowringiana
Brasso-Cattleya hybrids
Laelio-Cattleya hybrids
Paphiopedilum hybrids
Phalaenopsis Esmeralda
Dendrobium Phalaenopsis
Aerides odoratum

1933

Cattleya labiata
Cattleya Bowringiana
Brasso-Cattleya hybrids
Laelio-Cattleya hybrids
Paphiopedilum hybrids
Dendrobium Dearei
Dendrobium Phalaenopsis
Phalaenopsis Esmeralda
Phalaenopsis rosea
Phalaenopsis Rimestadtiana
Oncidium Lanceanum
Phaius grandifolius

1934

Cattleya labiata
Cattleya Bowringiana
Laelio-Cattleya hybrids
Brasso-Cattleya hybrids
Paphiopedilum hybrids
Oncidium Lanceanum
Brassavola nodosa
Epidendrum species
Dendrobium Phalaenopsis
Phalaenopsis Esmeralda
Aerides odoratum

1935

Cattleya labiata
Cattleya citrina
Cattleya Bowringiana
Brasso-Cattleya hybrids
Laelio-Cattleya hybrids
Paphiopedilum hybrids
Dendrobium Dearei
Dendrobium Phalaenopsis
Phalaenopsis Esmeralda
Phalaenopsis rosea
Aerides odoratum
Oncidium microchilum
Vanda coerulea
Brassavola nodosa
Brassia brachiata
Peristeria elata

NOTES

Mr. George H. Pring, Superintendent of the Garden, acted as one of the judges at the flower show at Granite City, Ill., November 16.

Dr. Edgar Anderson, Geneticist to the Garden, addressed the Washington University chapter of Phi Sigma, October 30, on "The Botanical Institutions of the Balkans."

Dr. David C. Fairburn, Research Assistant to the Garden, spoke before the St. Louis Section of the Council of Jewish Women, October 8, on "Rock Gardens."

Dr. Robert E. Woodson, Jr., Research Assistant to the Garden, has a paper in the November number of the *Bulletin of the Torrey Botanical Club*, entitled "The Floral Anatomy and Probable Affinities of the Genus Grisebachiella."

Recent visitors to the Garden include Mrs. Frances Williams, of Winchester, Massachusetts; Dr. D. M. Moore, professor of botany, University of Arkansas; and Mr. August Koch, Head Gardener, Garfield Park, Chicago; Mr. Jasper A. Clark, Head, biology department, Hannibal-LaGrange College, Hannibal, Mo.

The tropical grape vine which has been an interesting feature of the cycad-fern house for several years (see December, 1933, number of the BULLETIN) flowered for the first time in October. The flowers have made possible the exact identification of the vine. It proves to be *Cissus sicyoides* L. var. *Jacquini* Planchon.

During the month of September Mr. Ladislaus Cutak, in Charge of Succulents, spent a fortnight in the Southwest making collections for the Garden. Over 4000 miles were covered, and seeds, herbarium specimens, and living plants were brought back, chiefly from the Guadalupe Mountains, the White Sands, the Pinal Mountains, and the Granite Dells.

A comprehensive collection of hardy chrysanthemums has lent color and interest to the Linnean garden during the month of October. Though damaged somewhat by smoky nights and inclement weather, they have given a very good account of themselves. The dull reddish and bronzy shades which predominate in the hardy varieties combine well with the autumnal aspect of the garden. Particularly noteworthy have been the hybrids with the Korean Chrysanthemum created by Mr. Alex. Cummings, of Bristol, Connecticut.

STATISTICAL INFORMATION FOR OCTOBER, 1935

GARDEN ATTENDANCE:

Total number of visitors	28,345

LIBRARY ACCESSIONS:

Total number of books and pamphlets bought	14
Total number of books and pamphlets donated	243

PLANT ACCESSIONS:

Total number of plants donated	55
Total number of packets of seed donated	30

HERBARIUM ACCESSIONS:

By Purchase—

Bush, B. F.—Plants of Missouri, Arkansas, and Kansas	853
Collom, Mrs. Rose E.—Plants of Arizona	102
Erichsen, C. F. E.—Lichens of Germany, Nos. 101–200 inclusive	100
Fisher, George L.—Plants of Mexico	200
Lundell, C. L.—Plants of the Yucatan Peninsula	75

By Gift—

Anderson, Edgar—Description and illustrations of *Sophora Prodanii* Anderson	3
Couch, J. N.—Fungi of the United States	27
Cutak, L.—Plants of New Mexico	173
Deam, Charles C.—Plants of Indiana and Guatemala	46

Eilbracht, W. E.—*Solanum urbanum* Morong from horticulture 1
Field Museum of Natural History—*Philibertia gracilis* D. Don from Argentina..... 1
Fuller, Harry J.—*Parryella filifolia* T. & G. from the "Southwest" 1
Hetler, D. M.—*Euonymus atropurpureus* Jacq. from Missouri 1
Moore, D. M.—Plants of Arkansas..... 12
Ritchie, A. M. A.—*Euonymus atropurpureus* Jacq. from Missouri 1
Saeger, Albert—*Vernonia missurica* Raf.? from Missouri 1
Seibert, A. J.—Plants of Panama..... 61
Siple, Paul—Lichens of the 2nd Byrd Antarctic Expedition 85
University of Copenhagen, Botanical Museum—Photographs of types and co-types..... 6
Williams, L. O.—Plants of Wyoming, etc..... 57

By Exchange—
New York Botanical Garden—Photographs of types.... 186
University of California Herbarium—California Fungi, Nos. 301–416 inclusive..... 115

By Transfer—
Fairburn, David—*Senecio confusus* Britten from horticulture 6

Total..... 2,113

SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

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OF THE MISSOURI BOTANICAL GARDEN

THE GARDEN, 2315 TOWER GROVE AVENUE, ST. LOUIS, MISSOURI

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REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.
Hove, Sussex, England

MISSOURI BOTANICAL GARDEN BULLETIN

Vol. XXIII DECEMBER, 1935 No. 10

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CHRYSANTHEMUM "ANNA"

A branch of the Chrysanthemum "Anna" which has sported from white to yellow. From the 1935 chrysanthemum show.

Missouri Botanical Garden Bulletin

Vol. XXIII DECEMBER, 1935 No. 10

SPORTING OF THE CHRYSANTHEMUM

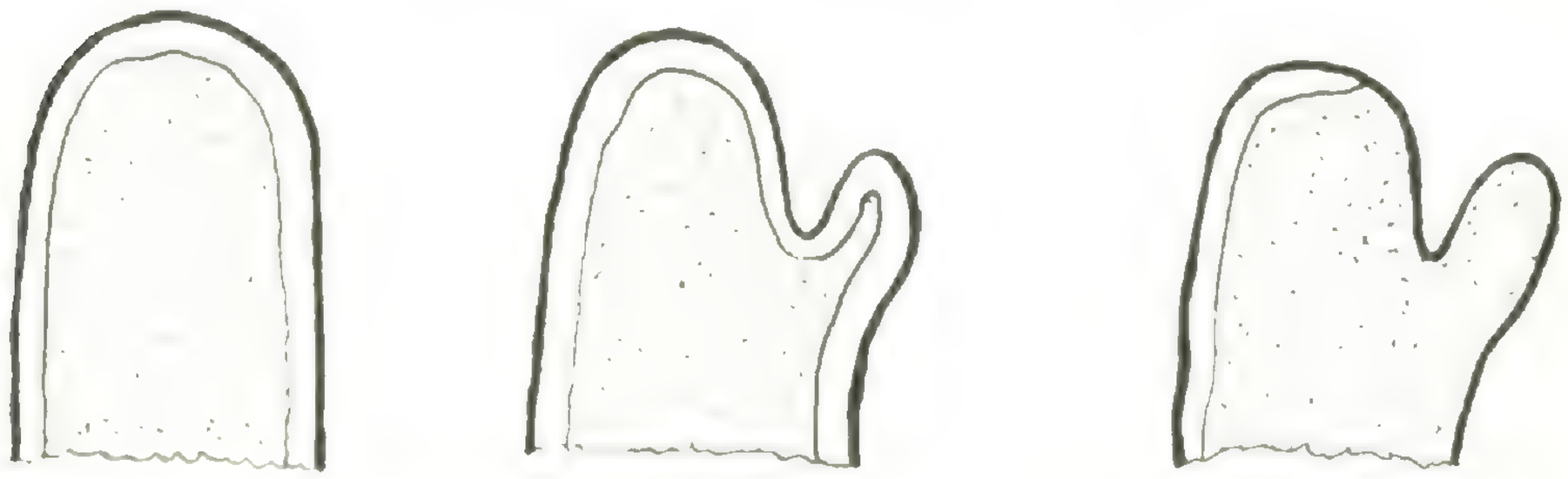
"Jean Hart" and "Anna" are two varieties of chrysanthemums, sisters surely, for they differ only in the color of their flowers. "Anna" is white and "Jean Hart" is yellow, but in every other way they look alike; both have single, daisy-like flowers, tinged with red as they begin to wither, both have the same sort of foliage and the same flowering time, and both a certain airy poise which makes them particularly suited for growing in hanging baskets.

In one detail of their behavior there is another and a striking difference. Like most plants, "Jean Hart" comes true when grown from cuttings or divisions. Year after year finds this variety with but one type of flower; solid yellow, tinged slightly with red as it ages. "Anna," on the other hand, changes nearly every year, sometimes a branch, or perhaps only a single flower-head. The change is always from white to yellow, and this year, as in other years, a sharp-eyed visitor to the chrysanthemum show may be startled, looking overhead, to see a patch of yellow blossoms in among the generally prevailing white.

It is a curious phenomenon. Why should these two sister varieties exhibit such a feminine difference in behavior? Why should there be in one family, so to speak, the inconstant "Anna" and the steadfast "Jean Hart"? Gardeners can give us a partial answer. Such changes they say are "sports," and it is through sporting that many new varieties originate. A Talisman rose, for instance, will suddenly produce a branch with deeper-toned flowers, and from this branch whole new

bushes can be grown which have the same color. At another time it may sport to a lighter shade, and in this way several daughter varieties may eventually arise from the original one. Such sports are rare. They occur in chrysanthemums, but not season after season on the same variety. We are apparently dealing here with some further complication.

Pressed for a fuller explanation as to why the variety "Anna" should consistently sport to yellow, the gardener gives up the question and says, "I don't know. 'Anna' is just ever-sporting. It sports to yellow pretty often, and that's that." A name is not an explanation, but it is something and we may well be thankful to the gardeners who noticed the phenomenon of sporting and gave it a name and who even noted the further fact that some varieties are "ever-sporting."



Diagrams illustrating possible explanation of ever-sporting: left, arrangement of tissues in "Anna," white over yellow (dotted); center, showing how this arrangement is perpetuated in buds and branches; right, yellow tissue breaks through, giving rise to branch which will bear yellow flowers.

For a more complete answer we shall have to turn to those botanists who study such matters in their laboratories and experimental plots. But not even from them shall we obtain a complete answer. Ever-sporting varieties, they tell us, may be caused in more than one way, and this scientific explanation will be hedged about with a whole bevy of probablies and perhapses. In the end they will tell us that the whole matter needs further study and that if we *really* want to know something about this particular case we should sit down with them awhile and go into the matter thoroughly.

Most probably, according to them, the white-flowered variety "Anna" is a mixture of two different tissues. It has a core of yellow and a skin of white. That is, the tissues deep within the leaves and stem, were they ever to produce flowers, would bear yellow ones. The surface tissues, from which the flowers usually arise, are without this ability, however, and consequently the flowers are white. Once in a great while the deeper tissue breaks through to the surface and is then in a position where it can show its difference at flowering time. The patch which has broken out from within will bear yellow flowers, while the rest of the plant will have white ones. The yellow sector is often somewhat irregular and may run through the center of a flower-head or through even a single petal, producing a curious, clown-like blossom, white on one side and yellow on the other.

According to this explanation, "Anna" probably originated when a single cell at the tip of a branch suddenly sported to white. The new white cell gave rise to further white cells, and there was produced a new kind of plant with a core of yellow tissue and a skin of white. Because of the exceedingly regular way in which plants develop at their growing points, this mixture of tissues, once formed, is liable to continue, barring accident. When new branches and new buds grow out each tissue propagates itself and the new branch has the same curious mixture as the old. Not until some slight accident brings the central tissue to the surface does the yellow reveal itself. Then those of us who know the variety and its fickle ways say, "Ah, yes, 'Anna' has sported again." E. A.

A SKYSCRAPER GREENHOUSE

It has been said on more than one occasion that for the Missouri Botanical Garden the hailstorm of 1928 was a blessing in disguise. It smashed glass to the tune of $50,000, but it gave the Garden an opportunity to try out several innovations in greenhouse construction, innovations which have been most successful and which save considerable money and effort every

year. A recent article in *The Florists' Review* (October 17, 1935) tells how the Missouri Botanical Garden has assisted in the development of even more radical changes in greenhouse construction.

"The division of bridges and buildings of the board of public service of St. Louis, for which William C. E. Becker is engineer, was asked in January, 1934, by the park department to have prepared plans for a building to replace the present Jewel Box and the first plans were for the usual type of greenhouse. Consulting with George T. Moore, director of the Missouri Botanical Garden, and George Pring, superintendent of the garden, Mr. Becker, after considerable research and experimental work, evolved the design of the proposed building.

"It is planned that the sides will be of glass, and there will be a series of four setbacks, so that the building at its widest will be fifty-five feet and the roof of the fifth plane only twenty-four and one-half feet wide. The glass panes will be 24 × 26 inches. The structural weight of the building will be supported by arches having a span of forty-nine feet.

REASONS FOR DESIGN

"Several considerations have fostered the plan for a greenhouse of so revolutionary a design. For one thing, during the winter, when it is desirable to allow as much light as possible to enter a greenhouse, the sun is low in altitude and the glass sides alone should permit the passage of as much light as is available. Another reason to eliminate a glass roof is the desire to prevent breakage of glass by hail, which in 1928 smashed $50,000 worth at the Missouri Botanical Garden, St. Louis, ruining some of the most valuable stock. Ordinarily, hail at St. Louis falls straight down, so that with no glass in the roof, the breakage of glass would be prevented unless an unusual wind drove the stones into the sides.

"The cost and labor of whitewashing the glass, necessary in the summer at all present St. Louis greenhouses, are to be eliminated at the new conservatory, where slat shades are to be provided. The exact style of such shades is to be determined by actual tests.

"There was yet another reason for the new greenhouse design—the desire for a building which will exemplify the new beauty of modern architecture, which developed from the need to utilize the maximum of light in crowded city areas and resulted in the recessing of the upper stories of tall buildings. Then there was one thing to determine—whether plants in such a building would have adequate light for growth.

"From that necessity came the aforementioned tests—calculation of the intensity of light in various buildings in which plants are now thriving at St. Louis, the construction of models of the proposed building and the measurement of the light which would enter such a structure.

MEASURE LIGHT IN HOUSES

"Arrangements were then made to take light readings in two building at the Missouri Botanical Garden—the palm house and the display house—and also at the present Jewel Box, the display house at Forest Park. Then models of the proposed building were made by the park department and mounted on a platform in a field east of the present Jewel Box.

"The measurement of light in the existing buildings was fairly simple, but calculation of the light that would enter a building which was only a plan was quite another matter.

"To consider the simpler problem first, the light in the present buildings was measured with illumination meters, loaned through the Union Electric Co. and the city lighting division. Each of these instruments contains two photoelectric eyes to pick up the light rays, the light energy then being turned into electric energy, indicated on a scale in foot candles.

IN PALM HOUSE

"At the palm house five points were chosen to give an accurate indication of the amount of light in the house; the points selected were those giving the maximum intensities of the light within the building. Five sets of readings were taken for solar declinations varying from –15 degrees 47 minutes to –17 degrees 22 minutes, the readings being taken, weather permitting, at intervals of one-half hour from 9 a. m. to 4 p. m. At the

two other houses, six sets each of readings were taken, at the same intervals and same hours as in the palm house. In the display house the declinations varied from 11 degrees to –15 degrees 6 minutes. The declinations at the Jewel Box ranged from +3 degrees 5 minutes to –10 degrees.

"Regarding the light which was found to enter the various structures measured, the ratios at the palm house, with an unmeasurable amount of interior shade, ranged from a low of .016 to a high of .195, meaning that the maximum intensity indoors during the time of the tests was never more than 19.5 per cent of the outdoor intensity and the minimum was but 1.6 per cent of the outdoor. Another discovery was that at no time during the light readings did more than 16.2 per cent of the outdoor intensity reach the floor.

"In official comments on the ratios, it is reported:

" 'These extremely low ratios in the palm house are suitable for the growth of the dense palms, as that is the condition under which they grow in nature. Due to this large amount of interior shade, the writer feels justified in neglecting the palm house from further discussion.'

TWENTY-THREE PER CENT

"At the display house, which is a large building and which is described as 'purely a display house with only a small amount of permanent growing,' the average ratios for any one point for any one day ranged from .087 to .414. The maximum intensity to which any point was subjected was .720 and the minimum was .043. Considering all points measured during the six days of the tests, the average intensity of the indoor light was only twenty-three per cent of the outdoor.

"The roof and the sides of the present Jewel Box had already been whitewashed when the light measurements were started there, and so the ratios were low. The individual readings showed a maximum of .778 and a low of .021, and the general average of the indoor intensity was only 15.5 per cent of the outdoor.

"During the light measurements in the present structures, and also in the models, it was observed that the ratios derived

on a hazy day, with no direct sunlight, did not agree with the ratios derived on a clear day, and it was then discovered that the ratio between the indoor and outdoor intensity was higher on a hazy day than for a bright day for a point in a shadow on a clear day. For the tests undertaken, the difference was not measured.

EXACT AMOUNT NEEDED

"'As to the exact amount of light needed in a floral house, that is a subject which is very much in the dark,' it is reported, but after a consideration of the way the plants in the present display house and the Jewel Box thrive, it is "assumed that an average ratio of, say possibly .350, will be considered quite high in a floral building.

"The tests, as mentioned before, also included the construction by the park department of two models of the proposed building and the measurement of the light that would enter such a structure. Each model was mounted on a platform in a field alongside the present Jewel Box, the platform being erected on a ball and socket joint so that the model could be tilted. To make the light measurements, the illumination meters were used in conjunction with a sundial chart prepared by Prof. H. R. Grummann, of Washington University, St. Louis.

SUNDIAL CHART

"The sundial chart showed the variation in the direction of the sun's rays throughout the year for St. Louis, and using it with a model that could be tilted allowed light measurements representing the conditions at any time of the year to be taken without continuing the tests through an actual twelve months. In a report the procedure is explained thus:

"'. . . by erecting the model on a ball and socket joint and mounting on each side of the model a sundial chart, it was possible to tilt the model and, by setting the end of the shadow of the sundial, to reproduce the sun's angle for any time of the year. By the sun's angle it was thereby possible to reproduce the actual sunlight condition for any particular time of the year.'

"The first model was unglazed and the roof supported by horizontal and sloping members framed into vertical columns inside the building. Thirteen points were selected to indicate the amount of light that might be expected to penetrate into such a building, the interior of which was painted black. Readings were taken with the light meters throughout the solar year from 9 a. m. to 4 p. m. at intervals of one hour.

CHANGE SECOND MODEL

"In the second model, also unglazed, the interior columns were eliminated by the use of curved roof beams and the interior was painted white. Then similar readings were taken. The second model was next changed slightly, a horizontal fascia strip being placed at the top and bottom of the vertical side walls, and light measurements were taken as before. In all cases, the photoelectric eye was laid flat on the cross members of the platform for the indoor readings and flat on the sundial chart for the outdoor.

"The average light intensity throughout the solar year for all points measured in the first model was twenty-eight per cent; in the second model, 42.9 per cent. For the second model that was altered with the fascia strips, which will probably be the construction of the new floral conservatory, the maximum sunlight intensity indoors was equal to the sunlight outdoors, the maximum individual ratio being 1.000 and the minimum .053.

"Commenting on the light intensities in the various buildings and models, a report contains the following:

" 'Considering, then, just the solar declinations for which readings were taken in both the model and either the Jewel Box or the display house, the data give evidence that unglazed the model will give a general average ratio of 2.2 times that of the general average ratio of the Jewel Box and display house.'

GLAZING

"All the tests were taken in actual greenhouse buildings and in models that were all unglazed. The present Jewel Box has

glazed walls and roof, while the palm house and display house at the Missouri Botanical Garden have part of the roof and side wall at both eaves covered with wood sheathing and shingles. The fact that 100 per cent of glass area was not necessary in the palm house and display house led directly to the development of the proposed design.

"In a discussion of the findings of various investigators in regard to the coefficient of the transmission of light through clear glass, it is tentatively concluded that it is somewhere between eighty and 100 per cent and it is suggested: 'Unless we are to accept the results of previous experiments by others, a little more research on the glass transmission coefficient will shed a clearer light on this question.' The cost of actually glazing the models would be prohibitive.

VALUE OF DATA

"A report on the experimental work poses one question: 'Will the proposed building when built function along the lines of the data obtained from the model?' Then, after consideration of the conclusions of several writers on the correlation of data from models and the actual structures, Randall is quoted:

" 'We have found in our research work on natural light and natural ventilation that, with careful design of models, the results are comparable with the theory which we have developed, and the actual measurements in the field. As a matter of fact, the relations between the three are as close as our ability to make the observation.'

"Commenting on the quotation, the report states:

" 'It is believed that Randall's last sentence is the key to the question which confronts us. How close can the observations be taken is in all probability the fact which determines how close the real building and the model will agree.'

"From all of the experimental work done, it is believed that the proposed design will provide a safe amount of light for its intended use.

"All of the experimental work was done by W. P. Hatfield, Arthur E. Biermann and William Koopman, Jr., of the division

of bridges and buildings, under the direction of William C. E. Becker.''

LETTERS FROM BOTANISTS OF COLONIAL TIMES

There has recently come into the hands of the Linnean Society of London a most interesting parcel of old correspondence, once the property of Thomas Potts James, of Cambridge and Philadelphia. James was among the friends and relatives of John Bartram and Humphrey Marshall who lent Dr. William Darlington the original material for his famous ''Memorials'' of these early-American botanists. Much of the material in this collection has therefore been reproduced in print, but there appear to be several interesting items which are as yet unpublished. The Garden's European representative, Mr. Gurney Wilson, has made copies of the following letters: one from Sir Joseph Banks, the great English naturalist, and one to Gronovius, the Dutch botanist who produced his *Flora Virginica* in 1739.

COPY OF LETTER FROM SIR JOSEPH BANKS TO JOHN BARTRAM

Mr. Banks wishes to agree with Mr. Bartram to send over direct specimens of plants to him on the following conditions:

1. All herbs plants & trees of all sorts & kinds to be sent over provided they have either fruits or flowers upon them.

2. If possible a specimen of fruit & another of flowers of each species.

3. No specimen less than 18 inches long except the plant is not so large then the whole to be gathered.

4. A ticket to be affixed to each & a catalogue sent of the whole referring to each & mentioning anything which may be thought worth notice relating to them.

5. A duplicate of each sent to be kept by Mr. Bartram with its number for the ease of future correspondence.

6. For each specimen of a distinct species or remarkable variety Mr. Banks shall receive he will allow 6 pence sterling so that each species by its specimen of flowers & other of fruit will bring Mr. Bartram 1 shilling or 5 lb. a hundred.

7. Mr. Banks sends Mr. Bartram a ream of paper and will from time to time as he shall want it send him more.

Jos: Banks.

Linnean Society's Archives

COPY OF JOHN BARTRAM'S LETTER TO DR. GRONOVIUS, LEYDEN FORWARDED THROUGH PETER COLLINSON

December ye 16th 1754.

Dear & well beloved friend

I have received thy kind letter of January ye 10th 1754 which was indeed very acceptable & more so being I thought thee had forgotten me I am very glad thee approves of my notions about several of my observations I have a little son about fifteen years of age that has traveled with me now three years: & ready he knows most of ye plants that grows in our four governments he hath drawn most of our oaks & birches with a draught of ye drownded lands & several of ye adjacent mountains & rivers as they appeared to him in his journey by them: this is his first essay in drawing plants & a map he hath drawn several birds before when he could find a little time from school where he Learns lattin I now send these draughts to our friend Peter Collinson whom I shall desire to send them as soon as a convenient opertunity offers to thee with our discription of ye birches thair general & perticular characters & wherein one species realy differs one from another in any soil or situation: these I send to thee to have thy opinion of ye method I have fallen into & if thee can inform me of a better I shall readily embrace it & whether it would not be better to have it published in Lattin I desighn next spring to set my son to draw some of our flowering trees & shrubs in thair flourishing state Our friend Slater tells me that thy son is like to be a great Curioso if he will write to me & let me know what will be acceptable I can furnish him with several curiosities: I have some thoughts of traveling to Carolina next spring however pray write to me as soon as possible which will oblige much thy friend

John Bartram

On the back of this letter Collinson has written: "His sons Drawings are very fine I wish they could be published if that could be done there is some natural history, belonging to each species, which you shall have besides very fine specimens of all the oaks & acorns and another Quire of all the evergreens of north America, but it is to be hoped your new edition of the Fl. Virg[a]. will take in all."

WINTER COURSES IN GARDENING FOR AMATEURS

ELEMENTARY COURSE

The elementary course in various phases of gardening for amateurs, which has been conducted at the Garden for the past few years, will be repeated in 1936. As formerly, it will commence in January, since it is believed that the course is of more value when given earlier in the year. The class will meet in the lecture room of the museum building (entrance at Tower Grove and Cleveland Avenue gate) at 3:45 p. m., Tuesday afternoons of each week.

REGISTRATION: It is desirable that registration be made by letter, with check payable to the Missouri Botanical Garden enclosed, as soon after December 20 as possible. Tickets will be ready for distribution on day of first lecture. Registration fees will also be received on January 7 at the lecture hall, at 3:00 o'clock.

FEES: The registration fee is $5.00 for each person, and tickets are not transferable.

The outline of the subjects to be discussed follows:

January 7—Brief discussion of catalogues, horticultural magazines, and bulletins. Illustrated lecture and instruction on rock gardens and wall gardens. The use of hot-beds and cold-frames .....Kohl

January 14—Trees and shrubs:
Pruning of shrubs at planting time.
Summer and winter pruning of trees and shrubs with relation to the time of bloom, i. e., trees and shrubs flowering in spring from buds formed the previous season; those blooming in summer on wood made during the current season .....Beilmann

January 21—Annuals, perennials. Illustrated lecture .....Kohl

January 28—General care of trees; the importance of tree surgery and the use of fertilizers.....Beilmann

February 4—Roses. Illustrated lecture .....Kohl

February 11—Lawns:
Seed lawns: Preparation of the soil, seed selection, fertilizers.
Stolon lawns: Methods of planting by means of stolons and plugging.
Lawns and their subsequent care .....Pring

February 18—Raising plants from seed, The students will sow seeds of annuals and perennials in the greenhouses, later transferring the plants to their own gardens.....Fairburn

February 25—Iris, peonies, and bulbs. Illustrated lecture ....Kohl

March 3—Controlling insect pests. Material to use .....Beilmann

March 10—Water gardens. Illustrated lecture.
Construction of pools.
Preparation of soil and planting.
Caring for hardy and tropical water-lilies during growing season.
Propagation by seeds, tubers, leaves.
Breeding.
Winter storage .....Pring

March 17—Moving pictures showing pruning, spraying, feeding, cabling, and transplanting .....Beilmann

March 24—Practical demonstration in the greenhouse of potting seedlings .....Fairburn

ADVANCED COURSE

The advanced course in gardening for amateurs will start February 6. The course of instruction will cover the practical phases of gardening as indicated in the following outline. The classes will be held in the experimental greenhouses from 10 to 12 a. m., Thursday of each week.

REGISTRATION: Limited to 30 students and open only to those who have taken the elementary course in gardening.

FEES: The registration fee is $10.00 per student and tickets are not transferable. Write or phone the Garden for reservations.

February 6—The nature of the plant:
A study of the life history of flowering plants including the structure and functions of roots, stems, leaves, buds, flowers, fruits, and seeds.

February 13—Soil management:
Chemical, physical, and biological relationships of soil. Preparation of fertile garden soil by students in the greenhouse.

February 20—Fertilizers:
What, when, and how to use organic and inorganic fertilizers for soil improvement. Fertilizer exhibit. Students will start an experiment in the greenhouse to show the effects of various fertilizer treatments on plant growth.

February 27—Insects and diseases:
Identification, injury, and control of common garden pests. Exhibit in the greenhouse showing various insects, diseases, injury to plants, insecticides, fungicides, sprayers and dusters. Books and bulletins on insects and diseases.

March 5–April 2—Plant propagation:
The propagation of plants is one of the most important and interesting phases of gardening. Five class periods will be devoted to this subject in order that the students may become familiar with a wide variety of plants and their methods of increase. The class will propagate various plants by the following methods:

a. Seed.
Students will raise various annuals and perennials from seed, and the plants may be transferred to their own gardens when the weather permits.
b. Stem cuttings.
c. Leaf cuttings.
d. Root cuttings.
e. Hardwood cuttings.
f. Rootstock or rhizome.
g. Tubers.
h. Tuberous roots.
i. Bulbs, bulb scales, corms and cormels. Experiments on bulb forcing in the greenhouse.
j. Viviparous leaves.
k. Stolons.
l. Layering.
m. Grafting and budding.

April 9—Potting of plants raised from seed.

April 16—Potting of plants raised from cuttings.

April 23—Trip to the Garden Arboretum at Gray Summit where the students will have an opportunity to see the large collection of orchids, the pinetum, the nursery, and much of the native flora.

April 30—Survey of desirable annuals and perennials. Review of garden maintenance and the care of house plants. Literature on gardening.

NOTES

Mr. L. P. Jensen, Manager Missouri Botanical Garden Arboretum, has been reelected president of the Henry Shaw Gardenway Association.

Dr. George T. Moore, Director of the Garden, spoke before the Engineers' Club of St. Louis, December 5, on "Some Inside Facts on Plants."

Dr. Samuel M. Feinberg, of Chicago, spent a day at the Garden recently in connection with his studies on the relation of fungous spores to allergic phenomena.

Mr. G. H. Pring, Superintendent of the Garden, spoke before the Signal Hill Garden Club, East St. Louis, Ill., November 19, on "Bulbs."

Mr. Ladislaus Cutak, in charge of succulents at the Garden, gave an illustrated talk before the Velata Public Speaking Society, at the Barr Branch Library, December 12, on "Vagabonding in the Southwest."

Dr. Edgar Anderson, Geneticist to the Garden, and Dorothea de Winton are authors of a paper in the *Annals of Botany* (**49**: 670–687, October, 1935) entitled "Genetics of *Primula sinensis*. V. The ontogenetic relationship of leaf and inflorescence."

Dr. Hermann von Schrenk, Pathologist to the Garden, spoke before the St. Louis Academy of Science, November 27, at Washington University on "Termites"; and before the Missouri Historical Society, November 29, on "Trees as Historians."

Dr. Edgar Anderson, Geneticist to the Garden, gave an illustrated talk before the Kirkwood Garden Club, November 18, on "Plant Hunting in the Balkans"; and before a joint meeting of the Association of Childhood Education and the St. Louis Nature Study Society, December 10, on "Trees in Winter."

Dr. Robert E. Woodson, Jr., Research Assistant to the Garden, has recently published the following papers: "On the Occurrence of *Lacmellia* and a New Species of *Zschokkea* in Central America," in *Tropical Woods* (No. 44: 22–24. 1935); with Leslie Hubricht, "*Tradescantia Wrightii* in New Mexico," in *Rhodora* **37**: 454–455. 1935; "Temnadenia," description of the genus in *Lemée's Dictionnaire Descriptif et Synonymique des Genres de Plantes Phanérogames* **6**: 480–481. Brest, 1935.

The fourth number of Volume XXII of the ANNALS OF THE MISSOURI BOTANICAL GARDEN has recently been issued, with contents as follows:

"The Reactions of Plants to Ultra-Violet." E. S. Reynolds.

"Studies in Ultra-Violet and Respiratory Phenomena. I. Review of Work Published before June, 1935." F. Lyle Wynd and E. S. Reynolds.

"Studies in Ultra-Violet and Respiratory Phenomena. II. The Effects of Ultra-Violet on Respiration and Respiratory Enzymes of Higher Plants." F. Lyle Wynd, Harry J. Fuller, and E. S. Reynolds.

"Studies in Ultra-Violet and Respiratory Phenomena. III. The Influence of Various Regions of the Spectrum on the Anaerobic Fermentation of Yeast." E. S. Reynolds and F. Lyle Wynd.

"A Note on the Application of the Glass Electrode to the Determination of Oxidation-Reduction Potentials." F. Lyle Wynd.

Recent visitors to the Garden include: Mrs. Lawrence Brown, of Boston and Rockport, Secretary Herb Society of America; Dr. Robert W. Webb, Senior Cotton Technologist, Bureau Agricultural Economics, U. S. Department of Agriculture; Mr. W. Boström, Swedish Ambassador to the United States; Mr. A. C. Hottes, Associate Editor *Better Homes and Gardens*, Des Moines, Iowa; Mr. Dan Beard, originator and founder Boy Scouts of America, now commander and honorary vice-president; Dr. H. W. Rickett, associate professor of botany, University of Missouri; Dr. Harry J. Fuller, associate in botany, University of Illinois; the Missouri Walk-Ways Association [at the Arboretum, Gray Summit]; Dr. C. O. Walton, President, Texas Agricultural and Mechanical College, Dr. A. B. Conner, Director, and Dr. Paul C. Mangelsdorf, Agronomist, Texas Agricultural Experiment Station, College Station; Mr. Edward Berry, of the University of Missouri.

The members of the staff of the Missouri Botanical Garden are taking an active part at the meetings of the American Association for the Advancement of Science, in St. Louis, December 31–January 2. Dr. George T. Moore, Director, is Chairman of the local arrangements committee; Dr. C. W. Dodge, Mycologist, is a member of the Council of the American Association, chairman of the committee on arrangements of the

American Phytopathological Society, and local representative of the Botanical Society of America, Mycological Society, and American Phytopathological Society; Dr. E. S. Reynolds, Physiologist, is chairman of the program committee of the American Association of Plant Physiologists; Dr. J. M. Greenman, Curator of the Herbarium, and Dr. Robert E. Woodson, Jr., Research Assistant, are chairman and secretary, respectively, of the systematic section of the Botanical Society of America.

Among the papers to be given by various members of the staff are the following:

Dr. George T. Moore, December 31, "The Botanist as a Cultivator."

Dr. George T. Moore, January 2, "The Missouri Botanical Garden as an Educational Institution for the Public."

Dr. Hermann von Schrenk, December 31, "Decay of Wood in Treated and Untreated Timbers."

Dr. Edgar Anderson, January 1, "The Evolutionary Pattern of the Genus Iris."

Dr. Ernest S. Reynolds, January 2, "Tree Temperatures and Thermostasy" and "Thermostasy and Water Ascent in Trees."

Dr. Robert E. Woodson, January 2, "The Peculiar Floral Fibers of Certain Gentianaceae."

Mr. George H. Pring, December 31, "The Missouri Botanical Garden."

The general public ordinarily hears very little about one of the most interesting features of the chrysanthemum show: the distribution to invalids and shut-ins. Every year when the show is taken down the ladies of the St. Louis Book and Flower Guild come to the Garden and spend a busy day making up into bouquets those flowers which are still in good condition. The bouquets are very widely distributed in the city as will be seen by glancing through the following list of recipients:

Alexian Bros. Hospital
Baptist Orphans Home
Barnard Free Skin and Cancer Hospital
Bethesda Hospital
Blind Girls Home (scented flowers only)
Central Institute for the Deaf

Children's Home Society of Mo.
Christian Hospital
Christian Old Folks Home
Christian Orphans Home
City Hospital No. 1
City Hospital No. 2
City Infirmary
City Sanitarium
Colored Orphans Home
Deaconess Hospital
DePaul Hospital
Firmin Desloge Hospital
Girls Home
Good Samaritan Altenheim
Home for Chronic Invalids
Home for the Friendless
Home of Aged and Infirm Israelites
Isolation Hospital
Jewish Hospital
Kingdom House Settlement
Kirkwood Old Folks Home
Koch Tuberculosis Hospital
Little Sisters of the Poor
Lutheran Convalescent Home
Lutheran Hospital
Marine Hospital
Masonic Home
Memorial Home
Methodist Orphans Home
Missouri Baptist Hospital
Missouri Pacific Hospital
Mother of Good Counsel Home
Mt. St. Rose Sanitarium
Night and Day Camp
Oblate Sisters Orphans Home
Orthodox Jewish Old Folks Home
Peoples Hospital
Russel Home
St. Ann's Hospital
St. Anthony's Hospital
St. John's Hospital
St. Joseph's Institute for the Deaf
St. Louis Altenheim
St. Louis Children's Hospital
St. Louis County Hospital
St. Luke's Hospital
St. Mary's Hospital
St. Vincent's Orphans Home
Shriners Hospital for Crippled Children
United States Veterans Hospital No. 92

STATISTICAL INFORMATION FOR NOVEMBER, 1935

GARDEN ATTENDANCE:
Total number of visitors..... 48,020

LIBRARY ACCESSIONS:
Total number of books and pamphlets bought..... 31
Total number of books and pamphlets donated..... 33

PLANT ACCESSIONS:
Total number of plants and seed packets donated..... 82

HERBARIUM ACCESSIONS:

By Purchase—
Herter, Guillermo—Plants of Uruguay..... 138
University of California by Mrs. H. P. Bracelin—Plants of Brazil collected by Mrs. Ynes Mexia..... 500

By Gift—
Anderson, E.—Miscellaneous herbarium specimens, fruit and seeds of *Iris*..... 62
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Bush, B. F.—Plants of Missouri	7
Erwin, A. E.—Seeds of *Cucurbita Pepo* var.	1
Williams, Louis O.—Plants of Wyoming and California	98
By Exchange—	
New York Botanical Garden—Plants of New Zealand	100
University of Oklahoma, by G. J. Goodman—Plants of Oklahoma	114
University of Wisconsin—Plants of Wisconsin	57
Williams, Louis O.—Plants of Wyoming, Colorado, New Mexico, and Arizona	12
By Transfer—	
Anderson, E.—*Pinus densiflora* Sieb. & Zucc. from horticulture	1
Cutak, L.—*Cissus sicyoides* L. var. *Jacquinii* Planch. from horticulture	6
Pring, G. H.—Plants of horticulture	2
Total	1,224

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SOME FACTS ABOUT THE GARDEN

The Missouri Botanical Garden was opened to the public by Mr. Henry Shaw about 1860. From that date to the death of Mr. Shaw, in 1889, the Garden was maintained under the personal direction of its founder, and while virtually a private garden it was, except at certain stated times, always open to the public. Although popularly known as "Shaw's Garden" the name Missouri Botanical Garden was designated by Mr. Shaw as its official title and in his will or in any of his writings he specifically referred to it as the "Missouri Botanical Garden." By a provision of Mr. Shaw's will the Garden passed at his death into the hands of a Board of Trustees. The original members of the Board were designated in the will, and the Board so constituted, exclusive of certain ex-officio members, is self-perpetuating. By a further provision of the will, the immediate direction of the Garden is vested in a Director, appointed by the Board of Trustees. The Garden receives no income from city or state, but is supported entirely from funds left by the founder.

The city Garden comprises 75 acres, where about 12,000 species of plants are growing. There is now in process of development a tract of land of over 1,600 acres outside the city limits which is to be devoted to (1) the propagation and growing of plants, trees, and shrubs, designed for showing either indoors or outside, at the city Garden, thus avoiding the existing difficulties of growing plants in the city atmosphere; (2) gradually establishing an arboretum as well as holding a certain area as a forest reservation, with the idea that possibly at some future time this may become the new botanical garden.

The Garden is open to the public every day in the year, except New Year's Day and Christmas—week days from 8:00 a. m. until sunset; Sundays from 10:00 a. m. until sunset.

The main entrance to the Garden is located at Tower Grove Avenue and Flora Place, on the Sarah car line (No. 42). Transfer south from all intersecting lines.

STAFF
OF THE MISSOURI BOTANICAL GARDEN

THE GARDEN, 2315 TOWER GROVE AVENUE, ST. LOUIS, MISSOURI

GEORGE T. MOORE,
Director

KATHERINE H. LEIGH,
Assistant to the Director

HERMANN VON SCHRENK,
Pathologist

JESSE M. GREENMAN,
Curator of Herbarium

ERNEST S. REYNOLDS,
Physiologist

CARROLL W. DODGE,
Mycologist

EDGAR ANDERSON,
Geneticist

ROBERT E. WOODSON, JR.,
Research Assistant

DAVID C. FAIRBURN,
Research Assistant

NELL C. HORNER,
Librarian and Editor of Publications

GEORGE H. PRING,
Superintendent

JOHN NOYES,
Consulting Landscape Architect

WILLIAM F. LANGAN,
Chief Engineer

JOSEPH LANGEN,
Assistant Engineer

ARTHUR D. FORRESTER,
Plant Recorder

ALBERT PEARSON,
Painter

PAUL A. KOHL,
Floriculturist

JOHN H. KELLOGG,
Plant Collector

AUGUST P. BEILMANN,
Aboriculturist

JOSEPH CUTAK,
In charge of Exotics

LADISLAUS CUTAK,
In charge of Succulents

THE ARBORETUM, GRAY SUMMIT, MISSOURI

LARS P. JENSEN,
Manager

ROY E. KISSECK,
Engineer

DAVID MILLER,
Orchid Grower

TROPICAL STATION, BALBOA, CANAL ZONE

REPRESENTATIVE IN EUROPE

GURNEY WILSON, F. L. S.
Hove, Sussex, England